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INTERVIEW WITH THE INVENTOR OF THE PLUNGER.

New York, May 31—Spl. Cor.—A representative of the Marine Review today interviewed Mr. John P. Holland, inventor of the Holland submarine torpedo boat, on the subject of the submarine torpedo boat Plunger, now lying in a partially completed condition in the yard of Columbian Iron Works at Baltimore, Md. The boat is being built for the United States government. The Review of May 18 contained an article from a Baltimore correspondent, in which it was stated that there was little or no prospect of the Plunger ever being completed and accepted by the government, and giving as a reason for the belief the alleged fact that the boat was too small for the machinery required to run it, and several other more or less serious imperfections. After reading the article over very carefully, Mr. Holland said with considerable emphasis that it was decidedly unfair in that portion which gave the impression that the blame for the unsatisfactory condition of the Plunger rested upon the Holland Torpedo Boat Co.

"In the first place," said Mr. Holland, "the delivery of the finished boat to us by the Columbian Iron Works is three years and five months overdue. There was no penalty clause inserted in the contract between our company and the Columbian people, so we have no way of compelling them to exercise diligence in the work on the boat. The entire blame for the delay in finishing the Plunger lies with the Columbian Iron Works and its president, the Hon. Mr. Malster, who, by the way, is also mayor of the city of Baltimore.

"As to the Plunger ever being finished, you may state that it will positively be completed and it will fully accomplish all the things that it was guaranteed to perform. Whether it will be an entire success or not can, of course, best be determined upon trial, but it will not be enlarged, nor will smaller machinery be used in any way. The idea that the machinery will fill the boat so full that a crew cannot get into it is simply absurd. To be sure there may not be as much room as we could wish for, but there will be room enough for all practical purposes. The Plunger is 85 feet long instead of 80, as the article states, and its machinery will be of 1,500 horse power."

Upon having his attention called to the paragraph in the Baltimore article which said: "Mr. Holland admits that all the British engineers are opposed to the submarine boat," he denied most emphatically that such was the fact. "I cannot speak for 'all' British engineers, nor indeed, can any other one man, but I know that some of them are not opposed to the submarine navigation theory at all. The British admiralty is unquestionably opposed to the idea, but on the other hand the French naval officers favor it. The French have studied the subject while the English have ignored it. Which would be most likely to form a valuable opinion?"

In reply to a question as to when the Plunger would probably be finished, Mr. Holland smiled and said: "Whenever the Hon. Mr. Malster and the Columbian Iron Works get ready to complete their contract. Just when that will be no living human being knows. As to the Holland company having already received a large portion of the contract price of the vessel from the government, I will say that their proper proportion according to contract has been turned over to the Columbian people. Of course the government is fully protected from loss, as is also the Holland company, so the ultimate loss—if loss there be—will fall upon the company of which Mr. Malster is the president."

Again referring to the original cause of delay, Mr. Holland said that the first piece of steel to be used in the construction of the Plunger was laid down in the yard on the day upon which the contract called for the delivery of the completed boat. This was but the beginning of a series of delays which has caused the completion of the boat to be so long overdue. The Plunger, he said, is of an entirely different pattern from the Holland, so the allegations that the defects found to exist in the former caused changes to be made in the plans of the latter, are groundless.

Mr. Holland's trip abroad has benefited his health to a considerable extent, although he is still far from robust. He thinks the future of submarine navigation is bright and is satisfied with the progress made by his new boat (the Holland) so far.

Exact figures regarding the first cargo of the new Wilson line steamer Henry W. Oliver are not at hand, but it will approximate 6500 gross or about 7300 net tons of ore, which is the largest cargo ever carried by a lake steamer through the rivers. The big tow barges of the Bessemer fleet have carried much larger cargoes, and one load moved by the steamer Superior City from Escanaba to South Chicago on about 18 feet draught was also larger than the Oliver's load, but the new Wilson ship will prove by great odds the largest steam freight carrier of the lakes. She is not equal in dimensions to the Bessemer steamer Morse, but the latter vessel is a very heavy structure and therefore not so large a carrier. The Oliver's cargo was loaded at Duluth and is to be delivered at Cleveland.

Mr. J. C. Gilchrist, well known to vessel men in all parts of the great lakes, is at the head of a national bank in Cleveland that opened its doors a few days ago, and which will be largely patronized by shipping interests. The name is the Coal and Iron National Bank and the capital is \$500,000. Officers and directors are: President, J. C. Gilchrist, vice-president, F. M. Osborne; cashier, A. B. Marshall, formerly with the National Bank of Commerce; assistant-cashier, J. H. Caswell; directors, J. C. Gilchrist, F. M. Osborne, H. A. Everett, Geo. E. Collings, Jno. Mitchell, F. H. Haserot, D. R. Warmington, W. C. Runyon, A. J. Gilchrist and A. B. Marshall.

ADVANCING FREIGHTS ON THE GREAT LAKES.

Only a short time ago the owner of vessels of medium capacity was wondering whether he was ever again to have a place in the business of moving freight on the great lakes. Today he easily holds the "center of the stage." His vessels were not large enough to live at the freights that were offered when prices were low and when most of the large carriers were engaged on season contracts. Now the ship owner who has tonnage available for charter from trip to trip is not accepting future engagements at any price. At no time since the season opened has there been on the market anything like the number of vessels required by shippers in any line, and the result has been a steady improvement in freights. Ore rates are already 10 to 15 cents a ton above the contract figures, which is a very unusual situation, as low rates invariably prevail after the first trip or two in the spring. As against the 60-cent contract rate on ore from ports at the head of Lake Superior the rate now on single-trip charters from that district is 75 cents, with 70 cents from Marquette and 65 cents from Escanaba. The movement of grain has not been especially heavy, but when it is understood that in most branches of the steel and iron industry manufacturers are fully sold up for the present year at prices that have startled the whole country, the present situation on the lakes is not surprising. The question is not how much ore should be moved but how can labor be secured to increase the present output in unlimited measure. The labor problem is of most importance to the iron ore companies. They are caring for the unloading of the ore and giving vessels good despatch at Lake Erie ports, and it would not be surprising to find that the output on June 1 will be well up to that of a year ago, notwithstanding the late opening of navigation, but how long this will continue will depend upon labor conditions at the mines from this time on. The coal shippers, who are refusing to meet the demands of vessel owners for 50 cents a ton to Lake Michigan ports and 40 cents to Lake Superior ports—just double the rates of a year ago—are depending upon a falling off in the ore movement to get in with their shipments. They are very much behind shipments of last year but are holding that this year, as in the past, a period of dullness during summer months will give them an opportunity to make up what they have lost thus far.

MORE NORTH GERMAN LLOYD SHIPS.

It is officially announced from New York that the North German Lloyd Steamship Co. will increase its capital 20,000,000 marks, about \$5,000,000, the additional capital to be applied to a fund that will be used for the construction of ten new vessels, the names and tonnage of which are: Grosser Kurfuerst, 12,500; Rhein, 10,000; Main, 10,000; Konig Albert, 10,000; Princess Irene, 10,000; Koln, 7,500; Frankfurt, 7,500; Hanover, 7,500; Strassburg, 5,000, and Wurzburg, 5,000. With the exception of the two last named, all will be twin-screw steamships.

The Grosser Kurfuerst will be used in the Bremen-New York service during the summer months and in the Bremen-Australian service in the winter. She will have accommodations for a large number of passengers and freight. The Rhein and the Main will carry freight between New York and Bremen, and the Konig Albert and Princess Irene will be assigned to the China service of the line. According to the present arrangement, the Koln, Frankfurt and Hanover will ply between Baltimore and Bremen, the Strassburg in the eastern trade and the Wurzburg in the coastwise trade on the other side of the Atlantic. The Kaiserin Maria Theresia, the latest addition to the North German Lloyd fleet, will sail from Bremen for New York on her maiden voyage on June 13. She is a twin-screw vessel of 9,500 tons register.

Valuations placed upon new vessels rated in the June supplement of the Inland Lloyd's Register are: Steamer Eureka, owned by W. A. Hawgood and others of Cleveland, \$150,000; steamer M. A. Hanna, Capt. John Mitchell and others of Cleveland, \$260,000; steamer Henry W. Oliver, Capt. Thomas Wilson and others, Cleveland, \$260,000; steamer Pennsylvania, Minnesota Steamship Co., Cleveland, \$260,000. The steamer Eliza W. Strong, formerly the N. K. Fairbanks, but rebuilt and now owned by Wm. Strong and others of Tonawanda, N. Y., is rated A 2, and valued at \$30,000.

An official abstract—very brief—of the report of the Nicaraguan canal commission as presented by Admiral Walker, the head of the commission, has been given out by the state department. The full report will not be made public until it is presented to congress by the president at the beginning of the next session. The commission believes that a canal can be built across the isthmus over the route they propose for not exceeding \$118,113,790. Col. Hains concurs generally with the views of the other members of the commission, but his estimate of the cost is \$134,818,308.

The newly incorporated New York Ship Building Co., at the head of which is H. B. Morse, formerly president of the Harlan & Hollingsworth Co., will establish its ship yard at Camden, N. J., and the Camden city council has granted a concession of 100 acres of land in South Camden. The New York company is capitalized at \$3,000,000 and it is represented that they will erect a number of buildings, one of which will be 1,400 feet in length, together with four dry docks, and will give employment to between 3,500 and 5,000 men.

It is announced from Toledo that as a result of the completion of dredging at that point there is now 19 feet of water over the bar and inside the harbor to most of the ore and coal docks.

SUBMARINE BOATS.

A SUMMARY OF THE EFFORTS THAT HAVE BEEN MADE DURING THREE CENTURIES TO BUILD SHIPS FOR SERVICE OF THE DEEP—
SOMETHING ABOUT TORPEDOES.

BY LAWRENCE IRWELL.

The nations of the earth are preaching peace with an apparent earnestness of purpose which seems strangely at variance with the preparations for war to be met with all over Europe. The construction of ironclads of gigantic proportions is being rapidly pushed forward at an immense outlay of public money, for, speaking in round numbers, the man-of-war of today represents the embodiment of an expenditure of \$5,000,000. Yet so rapid is the onward inexorable march of scientific discovery, that these mastless monstrosities are sometimes obsolete within two years of the time when they left the hands of the builders. Nor is this all that can be urged against such leviathans. They cannot be rendered absolutely invulnerable, and practical men are quick to devise some means whereby the ship of an enemy may be placed *hors de combat*. Electricity and modern explosives have greatly contributed to make almost anything possible to the modern investigator; and a certain amount of uneasiness exists that, in spite of all possible precautions, the battle may be "to the swift rather than to the strong"—to the manageable sling and stone of the boy, rather than to the cumbrous arms and armor of the giant. In the future, an ironclad may be compelled to surround herself with a cordon of boats, in order to be thoroughly protected from night attacks.

During the civil war, twenty-five ships were destroyed by the electric torpedoes of the confederates. The "infernal machines" used by the Russians during the Crimean War (1854-6) were simply small watertight cans, containing gunpowder, a mixture of sugar and chlorate of potash, and a glass bulb filled with sulphuric acid. The acid escaped when the bulb was broken by a ship striking against the can, and it trickled onto the prepared mixture, after which an explosion ensued. These "machines" were dangerous both to friends and to the enemy, and were of feeble intensity. Today, electricity is pressed into the dread service, as the igniting agent, and dynamite takes the place of gunpowder, because it explodes with far greater violence.

The Whitehead torpedoes cost about \$2000 each, are cigar-shaped, and are propelled through the water by the application of compressed air. The torpedo is composed of three parts—the head, which contains the explosive; the reservoir, in which air is compressed until it exerts a pressure of 600 pounds on the square inch; and the tail, containing the machinery of propulsion. This torpedo will travel a mile and a half at a depth of 8 feet under water, the first thousand yards being moved over at the rate of 20 miles an hour. It is liable to be deflected by currents from its otherwise straight course, but it has been asserted that this defect can be allowed for. The torpedo rises to the surface, if, owing to some accident, the explosion does not take place at the moment of striking the object aimed at; and an automatic arrangement renders it harmless, so as to admit of recapture without risk. About ten years since some French newspapers challenged the utility of torpedoes, but since then there has been ample scientific evidence of their value, and the government of France, like every other government, keeps a large stock of them on hand.

A common form of "fish-torpedo" is 14 feet long, with a diameter of 14 inches, and can travel 1800 yards with a speed of thirty-six miles an hour. A reservoir, coated with a nonconducting material, runs along the center, which is charged with hot water at a pressure of 400 pounds per square inch; and it is believed that the steam given off from the water would drive the torpedo's engine for an hour. The weight of the "fish" remains unaltered during the run, as the steam, when it has done its work, is condensed inside. As is well known, ships finding themselves in the vicinity of these destroyers, put out strong nets, so as to entangle the torpedoes within their meshes, and thus avert disaster.

Gun-cotton and dynamite are peculiarly sensitive to vibration, and their detonation is due to this very cause (by detonation is meant the sudden report caused by an explosion); so that, by exploding counter-mines, any torpedoes lying around a ship may be exploded, if they contain nitro-glycerine compounds. In the British navy, some of the men-of-war are supplied with a steam pinnace which is used for dropping and exploding counter-mines, in order to destroy the mines of an enemy, and clear a harbor for the attacking fleet. The engine is worked and all its movements controlled by electricity, the cable which supplies the motive-power being unwound from winches as the boat moves along. Wonderful as it may seem, the pinnace does its duty without any person being aboard of her. Although this accessory has been attached to the British navy for over twelve years, I have not been able to ascertain its existence in the navies of other nations. A commander may perceive and provide for the torpedo launched against him or sunk at the bottom of a harbor, but there is nothing to betray the presence of a submarine vessel approaching an ironclad, except, perhaps the bead on the water. A brief sketch of the history of submarine boats, which, aided by torpedoes, may be destined to be employed in the attempted destruction of ironclads will be of interest.

Even in times of remote antiquity, divers were employed to recover valuables from the depths of the sea, and also to carry despatches into besieged places. Aristotle refers to the bagpipes and the diving-bell. Diving-machines were certainly in use in the thirteenth century, and writers of that period assert that Alexander the Great was once a passenger in some sort of submarine boat. Van Drebbel, a Dutchman, built a submarine boat in London in 1664, which could contain twelve rowers as well as some passengers, and on one occasion King James I. took a trip below the water of the river Thames in this vessel. The inventor is said to have discovered a liquid possessing the important property of rendering the air in the confined space under hatches suitable for repeated inhalation, and thus to prolong the time which could be spent under water. At Amsterdam in 1653 a Frenchman exhibited a submarine vessel 72 feet in length, but he refused to divulge the secret of its construction. A learned father of the Roman Catholic church

wrote a book in 1664, in which he suggested the possibility of destroying hostile fleets by means of boats moving under the surface of the water.

During the War of Independence in 1776 Bushnell, a native of Connecticut, built the first submarine boat, properly so called. She was immersed by admitting water into tanks constructed for the purpose, and she rose to the surface again by letting fall leaden weights which were suspended to her keel, and at the same time pumping out the ballast-tanks. She was propelled under water by an oar placed horizontally beneath her, constructed after the fashion of an Archimedean screw, of which a good picture may be found in the Standard Dictionary, page 109. A second oar, placed vertically on the upper part of the boat, regulated the depth of immersion independently of the quantity of water in the tanks. This primitive project scarcely advanced beyond the experimental stage, for the guns of the British ships blew the boat to pieces almost as soon as she was launched. Fulton took up the idea in 1801, and having experimented in France with somewhat favorable results, he published a pamphlet upon the subject of submarine navigation. His boat was propelled by a screw, but we are ignorant as to what agency was brought into play in order to cause the propeller to revolve. The Nautilus, as she was called, carried four men, and was rigged with masts and sails, which, of course, were lowered previous to immersion. Compressed air stored up in a copper globe served to renew the vitiated atmosphere at the will of the commander. Fulton was engaged upon a new ship, the Mute, when his death took place. This vessel, perfected by the light of experience, was to be immersed only beneath the immediate surface of the water, and her course was to be directed by a helmsman, whose head rose just above the deck.

The brothers Coessin entered the lists at Havre, France, in 1809 with a submarine vessel propelled by oars, which gave to her, when submerged, a speed of 2 miles an hour. The method which they adopted to procure a continuous supply of fresh air was, however, very objectionable. Long leather tubes terminating in floats led from the body of the vessel to the sea-surface, like the tentacles of some strange sea-serpent. The resistance to the movement of the ship caused by these tubes as they were dragged through the water must have been very considerable, and the chances of their being dragged under water were great. Nevertheless, the commissioners appointed by the National Institute of France reported that "there is no longer any doubt of the possibility of establishing submarine navigation and at a trifling expense."

A noted smuggler named Johnson designed the largest of all submarine boats, in which he proposed to carry off Napoleon from the Island of St. Helena. His vessel was 100 feet in length, and her spars and rigging could be lowered and made fast to the deck. He determined to reach land at sundown, sink beneath the sea-surface, and approach sufficiently close to enable him to land one of the conspirators, who should arrange with the illustrious captive a plan for evading the vigilance of the guards. Johnson was promised a large sum of money if success should crown his efforts, and he was to receive £4000 (\$20,000) as soon as his vessel was ready for sea. Unfortunately for him, the report of Napoleon's death was received on the day that the rescue ship was coppered. Towards the end of Johnson's life he succeeded in building a boat which would remain under the surface of the river Thames for eight hours without any necessity for the introduction of fresh air.

Coming down to recent times, we find that, in 1882 a Roumanian invented a submarine ship, which, according to his specifications, could be guided for twelve hours when completely immersed. The depth of immersion could be varied from 100 to 300 feet at the will of the operator, and enough light was supplied to enable those on board to see a distance of 130 feet ahead. The air supplied to this boat was sufficient to last for fourteen hours, and the air reservoir could be filled again if necessary, even though under water, by means of tubes sent to the surface. Her progress through the water was to be absolutely noiseless, and great results were hoped for from this death-dealing apparatus. My efforts to obtain further information concerning this ship were not successful, and I am forced to conclude that she was chiefly a product of the inventor's enthusiasm—a failure when constructed.

The American boat Peacemaker created a great sensation in the nautical world. Like most of her kind, she was cigar-shaped with thinned ends, and when seen floating on the surface of the water somewhat resembled a capsized yacht. She was 30 feet long, with 8 feet beam and 7½ feet depth of hold. She had shell-plating seven-eighths of an inch thick, well stiffened, so as to withstand the greatest possible pressure of water. Her crew consisted of a helmsman and an engineer, who obtained an entrance into the hold by a small manhole, which closed with a closely fitting cover. A dome projecting from the upper surface of the hull was fitted with glass windows to enable the helmsman, who stood with his head in this raised space, to attend to the steering when the ship was not submerged. The delicate parts of the boat were protected from injury by a kind of crest, which ran fore and aft, thus giving her a very curious appearance. Some sleeves, made of impermeable material, were placed on each side of the dome so that the helmsman might readily apply the torpedoes at the most opportune moment by inserting his hands into the sleeves. Compressed air was stored up in tubes fixed to her sides, and it was proposed to absorb the carbon dioxide and all other deleterious products of combustion by chemical means. The ship was lighted by electricity and propelled by a steam engine of 14 horse-power, having its boiler surrounded by an iron jacket, like one iron pot inside another, enclosing between it and the boiler a saturated solution of caustic soda, which possesses great heating power when water-vapor is passed into it. The result of the Peacemaker's trial trip (in 1887) was said to be very satisfactory, for she attained a speed of 8 miles an hour when well submerged. Her builders, in addition, asserted that she could keep up this rate of travel for some hours. Her submersion was effected by filling her ballast-tanks with water, and she was raised by working a rudder which was movable around a horizontal axis. A pressure-gauge indicated the depth to which the boat had descended, and, owing to the position of the center of gravity, there was believed to be no danger of the boat "turning turtle." The torpedoes were fastened to her sides, and were made buoyant by external coverings of cork, and they were furnished with electro-magnets so that they would adhere to

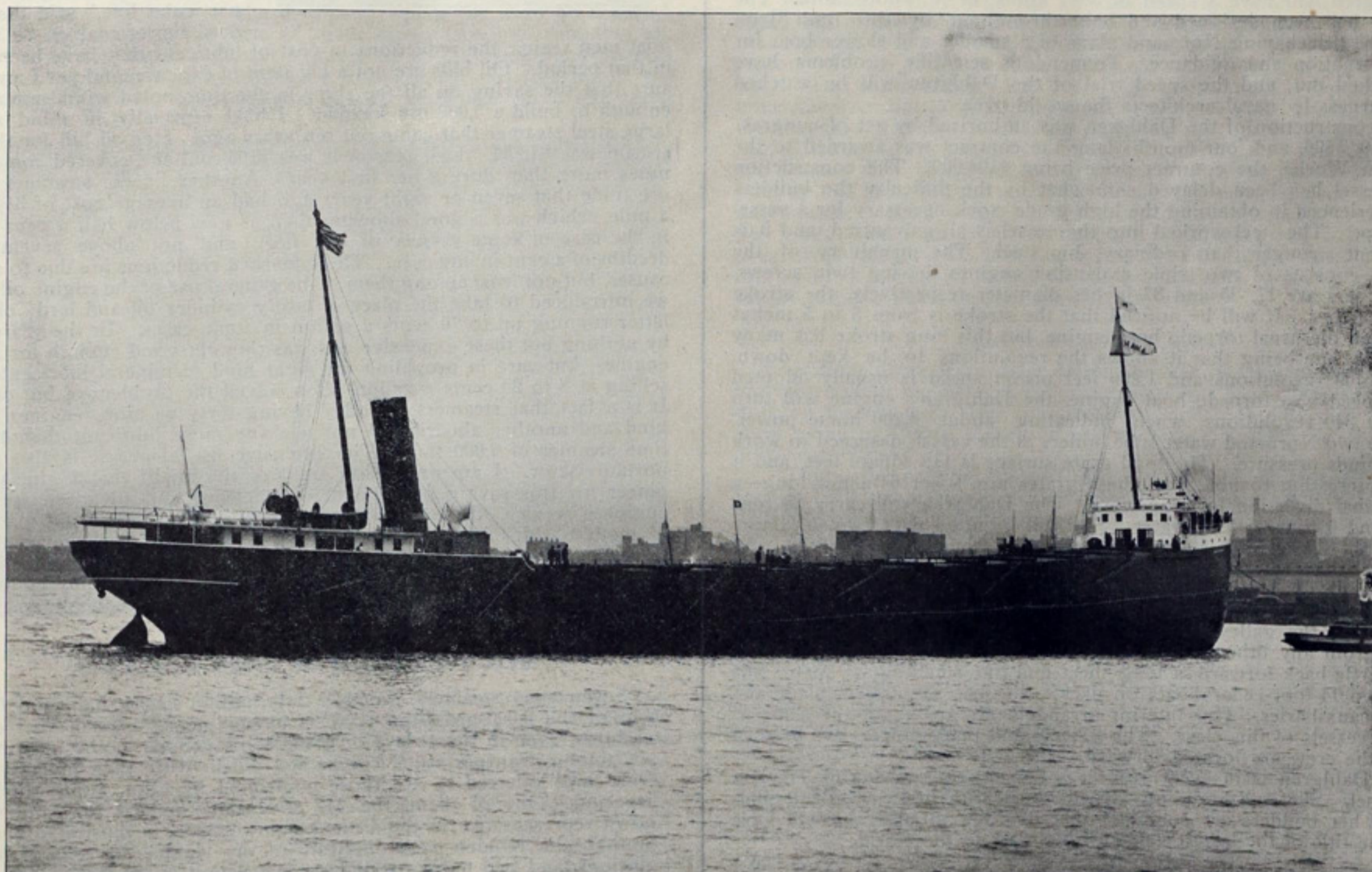
the bottom of the vessel destined for destruction. The designer of this sarcastically-named boat was Professor Tuck. The invention, however, was not a very marked success.

In 1886 the Porpoise was launched at Liverpool. This vessel was propelled by electricity. She was 37 feet long, 6 feet wide amidships, tapered to a point at each end, and had a "conning tower" and water-tight manhole similar to those of the Peacemaker. She was sunk by the introduction of water-ballast, aided by the adjustment of inclinable side-planes, and had a self-acting horizontal rudder placed right aft to keep her horizontal. She was fitted to carry compressed air, but, as an experiment, four people were shut up in her hold and at the end of three hours they had experienced no ill effects. The inventor believed that she could be used as a submarine torpedo boat, and he suggested that a diver, wearing a Fleuss dress and apparatus, should leave the boat when in proximity to any vessel that it is intended to blow up, affix a torpedo to her, and return through a water-tight compartment. This manoeuvre could not possibly be accomplished in time of war.

During 1886 and the following year a number of submarine boats were built by Nordenfeldt. The last one was tried at Southampton, England. She was 121 feet long, with a diameter of 12 feet, a displacement of 230 tons, and indicated 1000 horse-power with a speed of 15 knots when not immersed. Although this ship at the time seemed to answer all expectations, it was afterwards shown that she could not be

tinguish objects more than 25 feet away, and that even the electric light fails to illuminate objects at a greater distance in the darkness which is present at this depth; the color of the water is a deep green, and red objects are absolutely invisible. Where submarine boats seem to have achieved a great success is when moving just below the surface of the water with the optical glass, which is only about the thickness of a man's fist, showing above the surface. By means of this glass, a reflection of the objects passed, such as the hull of a vessel, is caught on a lens and then projected on to a suitable plate in view of the person steering. When the boat is completely below the surface, this image, although not strongly defined, is still sufficiently marked.

In 1892, congress made an appropriation of \$200,000 to enable the navy department to build and test a submarine boat, and the plan of Mr. J. P. Holland of New York for a boat of about 150 tons displacement was adopted. The boat had a 70 horse-power electric motor, worked from storage-batteries, for under-water propulsion. Her surface speed was designed to be 15 knots, with 100 horse-power steam engines actuating twin-screws, and her submerged speed eight knots for six hours. An automatic device controlling the verticle rudders enables a straight course to be held under water. The armament adopted consists of Whitehead torpedoes expelled from a pair of bow tubes. In addition to the diving-rudders this boat has a vertical screw at each end actuated by an eight horse-power electric motor to maintain submergence



THE M. A. HANNA, A MODERN ORE CARRIER—ONE OF THE NEW MITCHELL FLEET OF STEEL STEAMERS.

depended upon for practical work. In 1891 she was broken up and sold as old iron.

In 1888 a Mr. Campbell designed and built the Nautilus. The only point about her worthy of note was that she was driven by electricity.

Two boats built in France, the Goubet and the Gymote, seem to approach the workable type. No difficulty was experienced with them in sinking and rising to the surface, yet they ran on a perfectly straight course. When it was necessary to turn, the boats were brought to the surface, and were placed on their new course before again sinking. When they were moving at a depth of some 15 feet below the surface no trace of the course could be perceived on the top of the water, although their movements were followed from a captive balloon some 150 feet in the air. The Goubet has a displacement of about two tons, is 16 feet 5 inches long, 5 feet 10 inches deep, and has a beam 3.1 feet. Outside the boat at the stern she carries a torpedo charged with 110 pounds of dynamite. Her keel is detachable, weighing 900 kilograms, the dropping of which, in the event of the pumping out arrangements at any time breaking down, would enable the vessel to immediately rise. Her crew consists of only two men. She is fitted with reservoirs of compressed air, electric accumulators and motor. The Gymote is a ship about as large again, but otherwise very much like the Goubet.

Of the Spanish boat Peral no reliable information is at hand. According to official reports, made after her trial in May, 1889, she did wonderful things. But, as everybody knows, she did not reach American waters last year.

In spite of the relative success which has attended the trials of the various submarine boats, the experiments seem to have revealed certain practical difficulties which render it problematical if submarine navigation can ever be carried on with any degree of safety. It has been clearly demonstrated that at a depth of only some 50 feet it is impossible to dis-

when not moving. An important feature is an automatic safety device, by means of which, when a dangerous depth is reached, air is admitted into a bow compartment, expelling a large quantity of water, and, by raising the bow, changing the course upward. The experiment Holland boat to be built under construction for the government has been under construction at Baltimore since the appropriation above referred to was secured, and seems rather slow of completion. Another vessel of this type has been undergoing trials in New York harbor for a long time past.

VESSELS BUILDING AT CRAMPS.

Naval and merchant vessels now building at the yard of the William Cramp & Sons Co. at Philadelphia are as follows:

U. S. first-class battleship Alabama.....	11,500 tons.
U. S. first-class battleship Maine.....	13,500 tons.
Russian first-class battleship Retvizan.....	12,875 tons.
Russian first-class cruiser Variag.....	7,054 tons.
Oceanic S. S. Co.'s passenger steamer Sierra.....	9,690 tons.
Oceanic S. S. Co.'s passenger steamer Sonoma.....	9,690 tons.
Oceanic S. S. Co.'s passenger steamer Ventura.....	9,690 tons.
Plant Co.'s twin screw passenger steamer (not yet named).....	6,920 tons.
N. Y. & Cuba Mail S. S. Co.'s steamer Mexico.....	6,810 tons.

Capt. Robley D. Evans and Secretary of the Navy Long wrote significant letters of regret in response to invitations to be present at the dinner recently given in Philadelphia in honor of Admiral Sampson. Capt. Evans wrote: 'You all know my feelings toward Admiral Sampson. They are the same as those entertained by every officer who served under him except one. We honor him. We respect him. We love him.' Secretary Long regretted in his letter that Admiral Sampson's services had not been more generally appreciated by the people.

TORPEDO BOAT DAHLGREN.

A REMARKABLE CRAFT IN WHICH HIGH SPEED IS DEMANDED ON SMALL DISPLACEMENT—JUST LAUNCHED BY THE BATH IRON WORKS.

Possibly the fastest torpedo boat ever built in America, and the first of the new high-power torpedo boats to float in Atlantic waters, is the Dahlgren, officially known as torpedo boat No. 10, which was successfully launched from the yard of her builders, the Bath Iron Works, Bath, Me., on May 29. She is a little vessel of extraordinary interest, as her contract calls for 30½ knots speed on a displacement of about 150 tons. This high rate of speed is truly remarkable when we consider the very small displacement and heavy armament and equipment carried. The British 30-knot boats have just twice this displacement, viz., 300 tons, and all the other American 30-knot vessels, with the exception of the Dahlgren's sister, the T. A. M. Craven, also building at Bath, have displacements varying from 250 to 400 tons. The Dahlgren is 151 feet long and 16 feet 6 inches beam, with a mean draught loaded of 4 feet 8 inches. She is very little larger than the Foote, Rodgers and Winslow, but whereas the latter vessels have machinery capable of indicating but 2,000 horse power the Dahlgren's triple expansion engines of the Normand type have been designed for over 4,200 horse power. It is also interesting to note that whereas the vessels of the Foote class have a trial speed of 24½ knots, the Dahlgren will have a speed of 30½ knots, or 6 knots more. The Dahlgren has been designed and built throughout by the Bath Iron Works, the firm having Normand plans of a smaller and slower boat for their information and guidance. Tremendous scientific problems have been worked out, and the speed trial of the Dahlgren will be watched with eagerness by naval architects the world over.

The construction of the Dahlgren was authorized by act of congress of June 10, 1896, and four months later the contract was awarded to the Bath Iron Works, the contract price being \$194,000. The construction of the vessel has been delayed somewhat by the difficulty the builders have experienced in obtaining the high grade stock necessary for a vessel of this type. The steel worked into the vessel is all galvanized, and it is 40 per cent stronger than ordinary ship steel. The machinery of the Dahlgren consists of two triple expansion engines driving twin screws. The cylinders are 17, 25 and 37 inches diameter respectively, the stroke being 21 inches. It will be noticed that the stroke is from 3 to 5 inches longer than the usual torpedo boat engine, but this long stroke has many advantages, one being that it allows the revolutions to be kept down. Whereas 400 revolutions and 1,200 feet piston speed is usually adopted for the speed of a torpedo-boat engine, the Dahlgren's engine will turn up to but 340 revolutions when indicating about 4,200 horse power. There are two Normand water tube boilers in the vessel, designed to work at 230 pounds pressure. The total grate surface is 118 square feet, and it will be interesting to note that these grates are 9 feet 6 inches long—a very unusual diversion for ship work. The Dahlgren will carry 22 tons of coal and 6 tons of feed water. She will be fitted with two deck torpedo guns, discharging 18-inch Whitehead automobile torpedoes, and she will also carry four 1-pounder rapid-fire guns. The Dahlgren was launched with all her machinery on board. She is at present practically completed. Her short, straight smokestacks, rising only just above the awning, with the galley between them, make her appearance quite different from any other American boats. She has two conning towers but no turtle-back forward, a long sheer and one small signal spar. She carries two 14-foot cedar boats on deck. She has an electric plant and the usual auxiliaries. Her interior arrangements are about the same as all other vessels of this class. The officers and petty officers are berthed aft, and the crew are located forward.

The Dahlgren is in every respect a fine looking, powerful, efficient little vessel. She is a seagoing torpedo boat with most excellent qualities, and her builders are confident that in a few months she will have earned the title of the fastest vessel of her class in the world.

AMONG THE BUSY SHIP YARDS.

Success attended the launch at the yard of the Gas Engine & Power Co. and Seabury & Co. at Morris Heights, N. Y., of the handsome steam yacht Kanawha, building for John P. Duncan of New York to replace the yacht which he sold to the United States government last year. The new yacht is a flush-deck, schooner-rigged vessel with three masts and a yard on the foremast. She is 227 feet in length, 192 feet water line, 24 feet beam, 15 feet depth and 10 feet draught. This vessel, which is built of steel and has five watertight bulkheads, has a guaranteed speed of 22 miles an hour. Her equipment is first class throughout and includes a complete outfit of Blake pumps. Feed pumps are of the cross-compound simplex type, such as the Blake company recently furnished for the steam yacht Corsair.

It is understood that application will be made June 8 for the incorporation of the Ohio & Mississippi River Navigation Co. of Pittsburg, with initial capital of \$10,000, the object being to build and operate steamers. Theodore C. Poe, one of the incorporators, is now connected with the Pittsburg & Cincinnati Packet Line.

The Moran Bros. Co. of Seattle, Wash., has about completed the tug Alaska, building for service in Alaskan waters. The barges Yukon and Tanana are also nearing completion. Each are 100 feet in length, 35 feet beam and 5½ feet depth of hold.

Anderson & Listad of Grand Forks, North Dakota, are building a steamer to compete in the grain carrying trade with the steamer operated by the Great Northern railway on the Red river of the north.

The Southern Pacific Co. is building a stern-wheel steamer for service on the Sacramento river. She will have a draught of only 20 inches.

According to the latest statistics, the Japanese mercantile marine comprises 735 vessels, of a total measurement of 390,334 register tons, 570 of the number being steamers from 50 tons upwards, measuring 363,223 tons, and 165 being sailers of 100 tons and upwards, measuring 27,211 tons.

REDUCED OIL BILLS.

A chance remark in the office of one of the Cleveland vessel owners, a few days ago, brought out some interesting facts about costs of oils on steam vessels of the great lakes.



The salesman, whose likeness appears herewith, F. W. Jackson of the marine department of the Standard Oil Co., joined a group of ship owners who were discussing various matters pertaining to operating expenses. He possesses the happy faculty of making himself always welcome, and in this instance was soon brought into the conversation. Someone said in the way of a joke that everything had been reduced in cost excepting oils. The remark brought out a serious reply.

"I have often wondered during the ten or twelve years that I have been engaged in this particular line," said the Standard representative, "if steam-boat men realize the reductions in cost of lubricant that have been made in that period. Oil bills are not a big item of expense, and yet I am quite sure that the saving on all the ships in the time noted would amount to enough to build a 5,000-ton steamer. I have especially in mind now a large steel steamer that came out ten years ago. Her oil bill for the first season was \$1,250. Last season it was \$165 and she covered some 4,000 miles more than during her first year. Another line of steamers in the ore trade that seven or eight years ago had an average cost of 3½ cents a mile, which was a good showing then, is now below half a cent a mile in the case of some vessels of the fleet, and not above seventy-hundredths of a cent in any case. These marked reductions are due to several causes, but not least among them is the general use of the engine oil which we introduced to take the place of costly cylinder oil and lard oil, the latter running up to 70 cents a gallon in some cases. In the years gone by nothing but these expensive oils was thought good enough for marine engines, but care in providing the right kind of mineral lubricants, now selling at 8 to 20 cents a gallon, soon solved the problem of big oil bills. It is a fact that steamers of today having forty or more engines of one kind and another aboard will not use any more lubricant than the old time steamer of 2,000 tons. The extensive use of grease is also an important factor. I am not losing sight of the credit that is due the engineer for this saving on account of efficiency and advancement in the engine service. It is, of course, understood also that the machinery of modern ships is mechanically greatly improved over the product of previous years, and the facilities for feeding oil and overcoming friction are also constantly improving, but the oil man has certainly contributed his share of progress with the rest in the problem of reducing costs."

MITCHELL FLEET OF STEEL STEAMERS.

Seven steel steamers, worth a full million and a half, and four of them of the 6,000-gross-ton type, is by no means a small fleet of lake freighters, even in these days of great combinations in the iron industry and among transportation companies allied with that industry. The seven ships referred to are those controlled by Capt. John Mitchell of Cleveland. One of them, the M. A. Hanna, named for Ohio's well-known representative in the United States senate, is illustrated herewith. Another, the Holden, is a duplicate of the Hanna as regards hull dimensions, and two more are under construction at the Globe yard of the American Ship Building Co., one to be delivered in a couple of months but the other not to come out until April next. Three smaller steamers of the fleet have been in commission for three or four years past and are of only 4000 to 4500 gross tons capacity. These are the Lagonda, McWilliams and W. H. Gratwick.

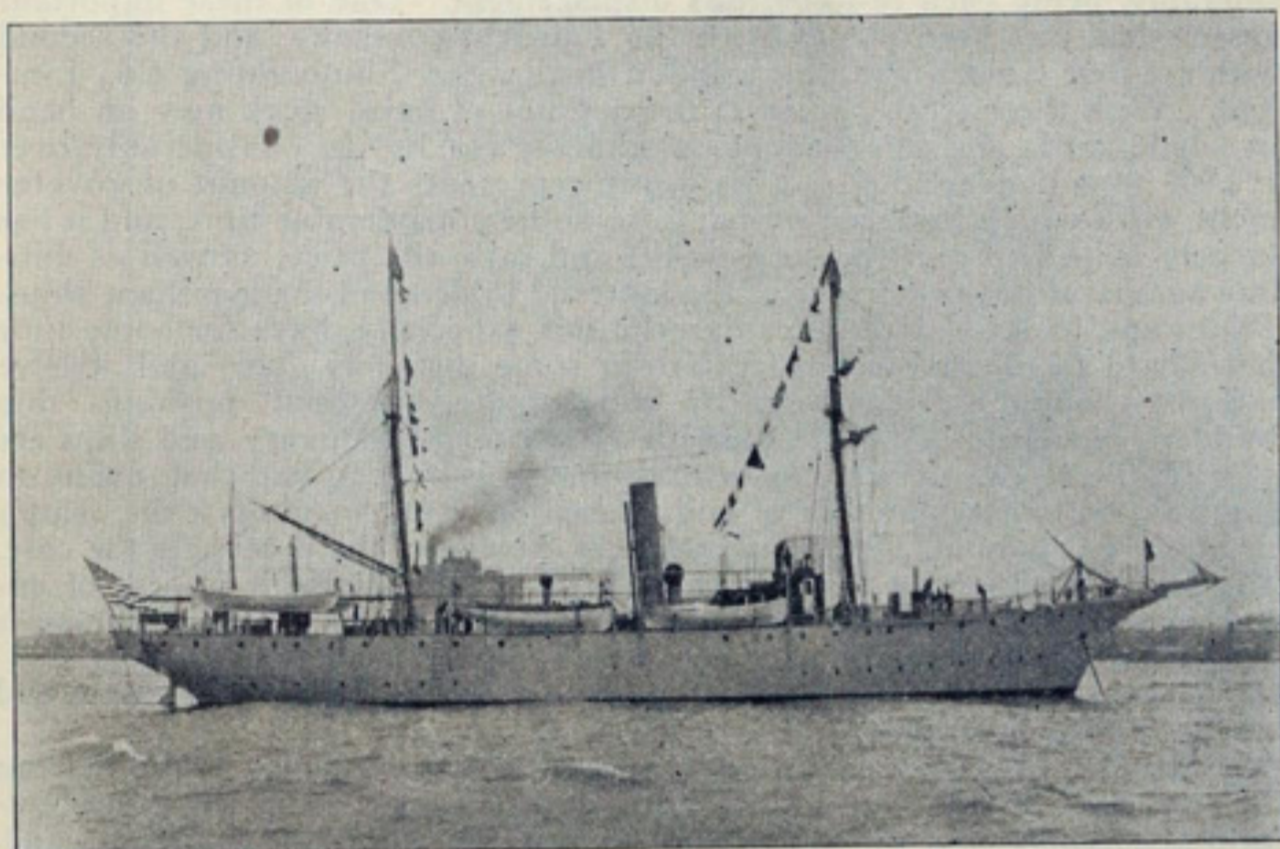
When the new ships of this fleet were ordered several months ago, the policy of the Mitchell interest in assuming heavy indebtedness for new vessels without direct connection of any kind with producing or manufacturing concerns in the iron industry, was criticized. Other vessel owners were being pushed aside by the concerns that had iron ore to guarantee a business for the ships. The "tramp" owner was supposed to have only a minor place in future operations on the lakes, as far as the transportation of ore is concerned, but with the change for the better that has taken place in all lines of industry, it is more than probable that the owners of those ships will find a profitable business for them for a long time to come. They are of a kind capable of competing with the best freighters afloat. The new ones among them would sell for many thousand dollars more than the prices at which contracts were made.

The Hanna on her first trip moved 238,587 bushels of corn (6,700 net tons) from Duluth to Buffalo on even 17 feet draught and at 11½ miles speed, loaded. This load is practically equal to the average cargo of the Holden-duplicate ship of the same fleet. Both steamers are of the same dimensions—410 feet between perpendiculars, 50 feet beam and 28 feet depth—but they differ in power. The Holden has quadruple expansion engines of 20¼, 30¼, 44 and 63 inches diameter, and 42 inches stroke, with three boilers, 12 feet diameter and 12 feet long, supplying steam at 230 pounds pressure. The Hanna has triple expansion engines of 23, 37½ and 63 inches diameter, and 42 inches stroke, with three boilers 12 feet 6 inches long and 12 feet diameter, supplying steam at 180 pounds pressure. Engines and boilers of the two new boats building at the Globe works are in all respects similar to those of the Hanna, but the ships themselves will each be 6 feet longer than either the Hanna or Holden. Boilers of all four of the steamers are fitted with the Ellis & Eaves system of induced draft.

PATHFINDER'S LONG JOURNEY.

The steamer *Pathfinder*, recently completed at Lewis Nixon's Crescent Ship Yard, Elizabethport, N. J., for the United States coast and geodetic survey has started upon her long journey to Alaska via the Straits of Magellan and San Francisco. Assistant F. W. Perkins of the coast and geodetic survey has been detailed to convey the ship to San Francisco. The present plan is to have the vessel, after leaving that city, where she will call for coal and provisions, start upon a reconnaissance along the southeast coast of Alaska and the Aleutian islands. She will follow the course usually taken by merchant vessels and will thoroughly survey the route, checking the old charts, compiled from various sources, upon which the service is now compelled to depend. When she returns to San Francisco the *Pathfinder* will bring the field parties now at work in Alaska. In all probability this steamer will be employed next winter in the service of a coast survey of the Hawaiian islands. The crew of the vessel is composed of enlisted men of the navy, who, under the personnel bill, become regular and not special service men as hitherto. The officers are the officials of the coast survey who have had seafaring experience.

This vessel was especially designed for the service in which she is to be utilized by Naval Architect Frank Willis Grogan. On such a ship are needed extensive quarters, room for stores for a long season, great coal endurance, speed to overcome the currents sweeping through the passes and into the inlets of the district in which she is to be engaged, as well as appliances in the form of boats, motor launches, sounding apparatus and instruments sufficient to carry on at the same time different classes of work, such as hydrography, topography, triangulation, determination of latitude and longitude, base measurement, etc. The vessel



STEAMER PATHFINDER RECENTLY COMPLETED BY LEWIS NIXON.

should be able to resist ordinary ice pressure and have safety arrangements in case of striking a sunken rock or shoal, always a possibility in the prosecution of a survey in comparatively unknown waters. That this vessel will meet the above requirements will be evident from the following description:

The *Pathfinder* is 196 feet over all, 165 feet on the water line, 33½ feet beam, with a depth of nearly 20 feet and a displacement of 875 tons on 11 feet mean draught. The coal bunker capacity is 250 tons and the steaming radius at moderate speed, about 7,000 miles. The available speed is 12 knots under steam, the propelling power being a single-screw triple-expansion engine, and for auxiliary propulsion she has a light brigantine rig spreading 4,500 square feet of canvas. The regular complement of officers and crew numbers about seventy, but additional quarters are provided aft for a considerable number of persons—extra scientific staff. The hull is of steel with special strengthening and double plating forward at the water line, and has seventeen water-tight compartments, the lower decks being water-tight. A portion of the bottom is double. The quarters for the crew are commodious and fitted with lavatory, etc. Steam is used for steering, hoisting boats, pumping and other purposes, and electricity is employed for lighting the vessel throughout. There is ample room for provisions and other stores for a long cruise. There are two large alco-vapor launches, two whaleboats, a cutter and a dingy, besides two large life rafts secured in readiness for immediate service in an emergency. Besides special apparatus for sounding, the vessel is furnished with instruments of the best type for every kind of surveying work.

John B. Roach of the Roach Ship Yard, Chester, Pa., is thus quoted in a recent interview: "The subsidy bill now before congress is being watched with much interest by American ship builders. It would be a wonderful boom for this country, because lines would be put into operation which under the present circumstances could not be made to pay. About twenty years ago my father started a line to Brazil, with the understanding that the United States would give us a subsidy, and the government of Brazil would do the same. But the subsidy from our own government was not forthcoming, and the line had to be abandoned. I have no doubt that if the present bill passes it will be re-established."

Emperor William of Germany, in reply to a recent announcement of the organization in the kingdom of a technical ship building association, sent a telegram expressing the keenest interest and remarking that the association will be called upon to "help the progress of this great industry which exercises such far reaching influences over the success and development of the nation."

THE WINIFRED SUIT.

PREVIOUS RECORD OF THE BATH IRON WORKS CITED IN SUPPORT OF THE ABILITY OF THE COMPANY TO BUILD SPEEDY VESSELS.

Bath, Me., May 31.—Spl. Cor.—The pioneer American tramp steamer *Winifred* has just made a fairly good trip from Porto Rico to New York, and it looks very much as if Messrs. Miller, Bull & Knowlton, her managing owners, have been a little premature in entering a suit against her builders, the Bath Iron Works of Bath, Me. The *Winifred* averaged about 9¾ knots for 24 hours, and her poorest day's performance averaged 8¾ knots, this speed being made with only 125 pounds of steam, whereas the boilers were built for 165 pounds pressure. The *Winifred* on trial attained a speed of 11½ knots, being in ballast at the time. This speed was made with natural draft, no attempt being made to force the vessel, and even the ventilating fans were not used. As the difference between the speed deep loaded and with ballast varies in vessels of this type from 1 to 1.3 knots, the builders' trial proved beyond a doubt that the *Winifred* is capable of steaming 10 knots an hour loaded in smooth water or under favorable conditions at sea. This is what the contract called for, and therefore the trouble, if any, seems to lie not with the builders but with the engineer force in the vessel.

The Bath Iron Works has an excellent reputation for getting high speed out of the vessels which they have constructed. The gunboats *Machias* and *Castine* exceeded their contract speed by 3.03 and 2.46 knots respectively, the greatest excess of any of the vessels of the United States navy. The yacht *Eleanor* has made 14½ knots at sea, whereas her contract called for but 12 knots, and the Bath Iron Works' latest production, the magnificent steam yacht *Aphrodite*, on her official speed test exceeded her contract speed by 2 knots. It will be also remembered that the steamer *City of Lowell*, the greyhound of Long Island Sound, was built by this firm, and the vessel has made 23½ miles an hour over an 18-mile course in dead water, whereas her contract speed was but 20 miles per hour. The Bath Iron Works are now building two 30½-knot torpedo boats and three 28-knot boats, and the two former vessels will have the honor of being the fastest vessels ever built in this country, and the fastest torpedo boats of their class in the world.

CUBAN SHIPPING.

Assistant Secretary of War Micklejohn has just given out the following information regarding the development of Cuban shipping since the duty on foreign-built ships was removed, and regarding also the privileges given to Cuban vessels in the matter of clearing for foreign and American ports:

"Under the original Cuban tariff, issued Aug. 8, 1898, the duty on foreign-built steamships into Cuba was \$3 in gold per ton measurement. This was afterward modified so as to abolish all registry fees imposed for documenting foreign-built vessels in Cuba, and the duties referred to have been suspended. As matters stand a foreign-built vessel can be registered in Cuba free of any fee and without payment of any customs duty for its importation. Such vessels can engage in the Cuban coasting trade without any further expense, upon the granting of a permit therefor by the governor-general of Cuba, which can be obtained upon application through the collector of customs by the managing owner making the required affidavit, stating that he is a resident of Cuba and renouncing his allegiance to any foreign potentate, and by the master taking oath that he will obey the laws and regulations prescribed by the properly constituted authorities of the island of Cuba.

"So far nearly 200 vessels, aggregating over 20,000 tons measurement, have taken advantage of this last named privilege, nearly all of which were prior thereto under the Spanish flag. The majority of the large-size vessels of this class are foreign built, Glasgow being the principal place of construction. The removal of the former restrictions and duty on foreign-built vessels into Cuba and the new clause which permits such vessels to engage in the Cuban coasting trade were designed to encourage ownership of vessels by Cubans and the maritime development of the island.

"By the issuance of the tariff circular, a few days ago, the war department gave to Cuban vessels the privilege of clearing for American and foreign ports under certain conditions. It reads as follows: 'Officers of the customs in the island of Cuba may authorize the clearance for foreign ports or ports of the United States of vessels under the distinctive signal and coasting permit of Cuba. In granting such clearances officers of customs will advise masters or owners that the United States does not assume any obligation for the protection of the vessel, and the clearance does not exempt the vessel in foreign ports or ports of the United States from penalties or forfeitures of any description which may be incurred.'

A SIX-MASTED SCHOONER.

Great interest aroused in the six-masted schooner to be built by H. M. Bean of Camden, Me., for Capt. J. G. Crowley of Taunton, Mass., is no doubt due in a considerable degree to the rapid development of late in this type of craft on the Atlantic coast. As late as thirty years ago the largest schooners turned out at Maine shipyards did not exceed 250 tons. The first three-masted vessels were built in the seventies, and in 1880 the maximum size was 600 tons. During the ten years which followed, however, the increase in the tonnage of vessels was considerable, there being built a number of schooners of 900 tons burden with a coal carrying capacity ranging from 1,000 to 1,400 tons.

The latter part of the eighties saw the advent of both the four and five-masted vessels, the greatest of the fleet of that period being the five-master Governor Ames of 1,689 net tons. Since that time larger five-masters have been constructed, notably the Frank Palmer of 1,832 tons, and the John B. Prescott and Nataniel T. Palmer. These latter vessels, as readers of the Review will remember, were constructed during the past season. Each is of about 2,245 tons and has a carrying capacity of from 4,000 to 4,400 tons. The new six-master is to be ready for launching in June, 1900.

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Foreign dealers in grain are planning through underwriters to get around an important provision of the Harter act. The London Corn Trade Association will endeavor after June 15 to enforce a form of contract that includes insurance against damage arising under the well-known exemption clause of this act. American underwriters are objecting to cover the proposed new risk, but it is understood that foreign companies have expressed their willingness to do so at an additional charge of one thirty-second of one per cent. The clause required after June 15 by the London Corn Trade Association reads: "The assured is held covered against 'damage or loss resulting from faults or errors in navigation or in the management of said vessel,' for which 'the vessel, her owner or owners, agent or charterers,' is or are, relieved of responsibility under section 3 of the act of congress of the United States approved Feb. 13, 1893, but nothing in this clause contained shall limit or affect any right which the underwriters may have by subrogation, or otherwise, against the owners of the said vessel."

The letter of Senator M. A. Hanna addressed to the governors of western states in the hope of bringing up the subject of the upbuilding of our merchant marine at the sessions of the Trans-Mississippi congress brought many responses, among others one from Governor Stanley of Kansas who says: "I am in receipt of your letter relating to the question of American commerce, and calling my attention to the fact that our people are paying out annually more than \$200,000,000 for transportation in foreign ships. I agree with you that this is a great question, and one that ought to be entirely out of politics. I have already appointed delegates to the Trans-Mississippi Congress, and it is too late to express to them my views on this question but I have some part on the programme at Wichita, and I shall take great pleasure at that time in calling the attention of the congress to this question."

Improvements in ship yards seem to be the order of the day and manufacturers of ship building machinery and tools are consequently more than rushed with orders. At the Philadelphia plant of the Wm. Cramp & Sons Co., for instance, the facilities for getting out work are severely taxed and it is understood that negotiations for adjoining property, projected or under way are prompted by the necessity for more working space. The new forge shop is about completed. The Harlan & Hollingsworth Co., which also operates a yard on the Delaware, has lately made extensive additions to its equipment, including a large gantry crane which was installed by the Morgan Engineering Co. of Alliance, O.

Work is progressing rapidly on the projected commonwealth dock system in Boston harbor. The first pier, which is now nearing completion, will provide an aggregate of 13 acres of space. In the construction of the sea wall there were used 9,810 cubic yards of stone; 7,260 spruce piles 40 to 50 feet in length; 172,000 feet of spruce lumber; 13,500 cubic yards foundation ballast; 51,300 yards of small stone; 6,800 cubic yards of ballast for back of sea wall; 7,260 oak treenails, and 360 pounds of iron spikes. In building the bulkhead there were used forty spruce piles, each 50 to 60 feet in length; 5,500 feet of spruce lumber; 600 bolts; 100 pounds of iron spikes, and 260,000 cubic yards of dredge material.

The Engineer of London in its number for May 12, completes a series of five articles on "The Naval Boiler of the Future." It concludes that this will be the fire-tube boiler and not the water-tube boiler which is now in so much favor. It believes that it is possible to reduce the weight of the shell of a fire-tube boiler and to reduce the quantity of water in it, so that it would be made a successful competitor with the water-tube boiler for marine work. The Belleville boiler, will, the Engineer says, no doubt maintain its position for some time to come, say, at least six years. But it remains to be seen if, when worn out after two commissions, they will be replaced.

A contract for another of the larger rafts, such as were constructed on the Pacific coast during the past year, has just been closed by Capt. H. R. Robertson of the Roberston Raft Co. with John Festerben of Seattle, Wash. The raft, which is to be constructed at Stella on the Columbia river and delivered at Astoria by August 15, will consist of 550,000 piles, or a total of 10,000 or 11,000 sticks. Another of these large rafts is building at West Seattle and it has lately been decided to increase its dimensions so that when completed it will contain 14,000 sticks or fully 2,000 more than originally intended.

The navy department and the United States light-house board contributed very interesting exhibits to the Electrical Exposition, which has been in progress in New York city for several weeks past. The navy department showed among other things a night signal system, battle order indicator showing method of communicating between the commanding officer and gun crews, diving lamp, method of naval wiring, and search-lights from the Maine and Texas. The light-house board showed among other appliances an improved type of electric buoy.

UNSTEADINESS OF WORKMEN.

PUBLIC COMPLAINT FROM EMPLOYERS ON THE CLYDE—TIME LOST ON ACCOUNT OF DRUNKENNESS AND WILFUL NEGLECT OF WORK—A TRIAL OF WEEKLY PAYS WITH FOUR DAYS' WAGES HELD BACK.

American ship builders, if to no great extent sufferers from the difficulties encountered by engineering firms on the Clyde in dealing with their workmen, will nevertheless be interested in reports published of late regarding labor conditions on the other side of the Atlantic. It is again charged that the greater the demand in ship building, the greater has been the unsteadiness of the men, especially riveters, platers and frame setters, and the greater their unwillingness to act with employers for mutual advantage. This phase of the ship yard labor question in America is being settled to a large extent by the introduction of new machinery, steel ships having been built in two or three cases at Chicago with all rivets driven by pneumatic tools. The Engineer of London says:

"The cessation in placing orders for new shipping with Clyde ship builders, which set in about three months ago, and has since become more and more pronounced, is helping materially to moderate the boom which has prevailed, and it may be expected soon to bring matters back to something like their normal balance. Since the new year only some 70,000 tons have been booked, as compared with 250,000 tons in the first four months of last year. The output during the four months is a record figure, being about 150,000 tons, although for reasons which will afterwards appear the aggregate might well have been much higher. To the list of new contracts, however, there should be added the two additional cruisers of the modified Cressy class, which in themselves raise the tonnage considerably, being each of 9,800 tons displacement. One of these important vessels has just been placed with the Fairfield company, and the second with another Govan firm, the London & Glasgow Shipbuilding Co., Limited. With these fresh contracts the amount of naval work now on hand in Clyde yards and finishing at its wharves reaches to considerably over 100,000 tons displacement. This figure represents the amount of government work which has been on hand for some considerable time, and it has largely helped to glut the steel works and raise the price, as well as militate against timeous delivery of the material in demand for merchant ships. Plates and bars, of the lighter descriptions especially, have for some time been hard to obtain, and orders are in some instances ten and twelve months behind. Even where by importunate personal pushing ship builders succeed in getting a measure of reasonable delivery, and ships are sent off the stocks not greatly behind time, it is only to find that, owing to the want of boiler plates or of engine castings or forgings, the ship's machinery is behind. In many instances, however, the reverse is the case, and some engineering firms have in their works numbers of sets of engines completed, for which the hulls are still to launch. The consequences are, in too many cases, that vessels which should have been earning dividends several months ago are still on the stocks, or lying at the quays and docks of Glasgow.

"In face of such a condition of things, a distinct pause in the placing of new orders is only, of course, natural—quite apart from the consideration of the height to which the price of material and labor has risen—and, it may be said, also quite acceptable. Previous briskness in placing new contracts, however, has been such that, in most cases, builders have still orders on their books, notwithstanding that all available berths are occupied. Any influences at work, therefore, in retarding the completion of contracts on hand are now acutely irksome. In addition to the annoying delay and irregularity in delivering material, there is the other fruitful source of worry and loss—the waste of working time by certain branches of operatives. To some extent the difficulty as to supply of material is the cause of the loss of workmen's time, but for the most part this loss on the part of boilermakers and iron ship builders—the riveting sections especially—is attributable to unsteadiness, thriftlessness and a lack of will or desire to make the most of the present spell of good trade. For wilful and unauthorized stoppages of work on the part of members of the boilermakers' and iron ship builders' society, Mr. Knight, the secretary, has been soundly rating culprits in his recent reports, and certain of the Clyde employers have been publicly calling attention to the great cause they have for complaint in these connections. It has all along been found that the greater the demand in ship building the greater has been the unsteadiness and thriftlessness amongst riveters, platers and frame setters. Working in squads, as such operatives do, the absence of any single member—say, the holder-on, or even the rivet boy—is enough to cause, or excuse, wholesale stoppage. Feeling persuaded that there is abundance of work ahead, and able as they are to make a sufficiently adequate pay in say eight or nine days out of the twelve, certain classes of operatives are in no way concerned about getting work out at contract time, or about the loss to employers, who have to keep machinery going and pay fixed wages to a large regulation staff of officials and foremen.

"From observation and record in many of the Clyde yards within recent times, it appears that—allowing for unsuitable weather, etc.—the time lost by riveters and platers through unsteadiness is as much as from 25 to 30 per cent., and in special cases the number of hours wrought per week by platers during the past three months has averaged only twenty-seven out of the fifty-four, representing as much as 50 per cent. of idle time. The loss of time by engineers and brass-finishers, it is at least some satisfaction to know, is only from 5 to about 10 per cent. It is, of course, well recognized that the large proportion of the time lost is due to drunkenness and wilful neglect of work for some days at the beginning of the week following each pay. On the part of the workmen themselves, there has for some time been an agitation for weekly instead of fortnightly pays, and the principal argument used has been that under the system of weekly pays ruling elsewhere, less time is lost and a higher standard of comfort prevails than under the system of fortnightly pays. Employers and managers on the Clyde have been somewhat slow to credit this; but—pretty much on the principle that they cannot be much worse—are they are resolved to give the system a trial, although at considerably increased outlay for extra clerks and altered systems of time and book-keeping. Dating from last week, the workmen will be paid every week in place of every fortnight for twelve months, the employers reserving the

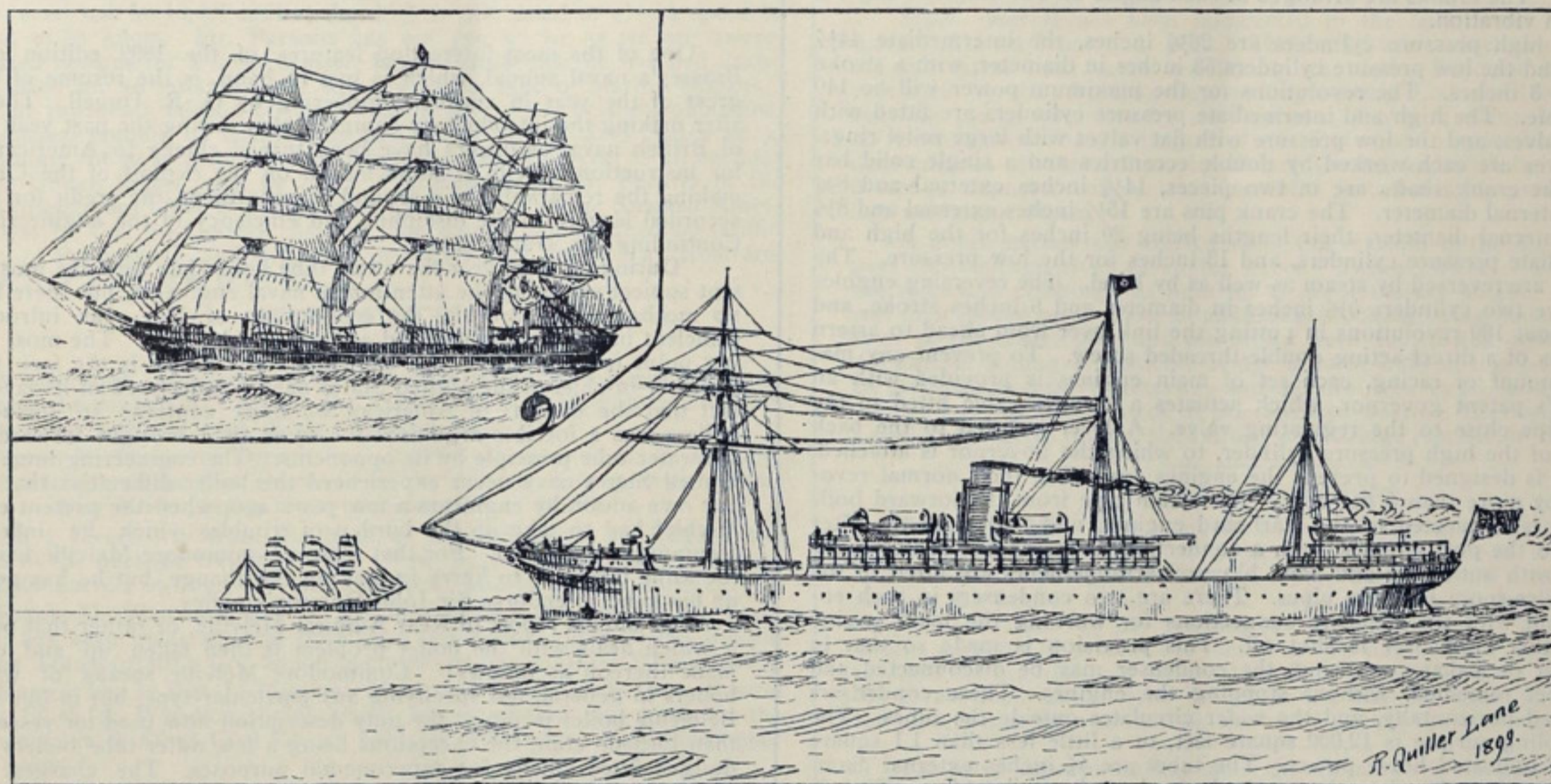
right at the end of that period to return to the fortnightly pays if they find that the new system has resulted in a greater loss of working time than under the old. Because numbers of workmen waste from two to three days every fortnight in a Bacchanalian 'burst' and its unfitting and depraving consequences, the fear has been freely expressed that the devotees will make the orgie weekly instead of fortnightly, and that as a result little or no work at all will be got out of them. This may be the effect in specially hard cases, but to operate against this danger it has been mutually agreed that wages each week shall be paid up only to Tuesday night. There will thus be four days' wages withheld by the employers as 'lying time.' This is a fairly big slice of the week's earnings to keep in hand, and workmen in the circumstances will, one would imagine, be apt to think twice before qualifying for loss of their jobs. By such means, and with the special efforts that will be made by the officials of the men's societies to keep them up to the mark, the experiment should surely prove such as will encourage the employers to make the system permanent. The workmen, at all events, have had their way, and are now put on their mettle. It lies with them to show, by regular attendance and increasing the average of time worked, that the employers of Clydeside were wrong in their fears that Clyde workmen could not be trusted with weekly pays. It lies with them also to show that the output of tonnage per building berth on the Clyde can be made to approach, if not exceed, that of any other center, although it has for some time been the boast that in the yards of the North-East coast—where weekly pays prevail, and there is not the same subjugating desire for periodic 'bursts'—the output per berth is often double that per berth in Clyde yards."

RECOVERY OF REINA MERCEDES.

President I. J. Merritt of the Merritt-Chapman Wrecking Co., New York, went to Santiago and personally superintended the preparation of the Spanish cruiser Reina Mercedes for her trip to the United States, and then accompanied the vessel to Norfolk, Va. Capt. Merritt makes the interesting statement that he is confident that all the sunken Spanish vessels could be recovered if the government cared to spend sufficient money. In speaking of the present condition of the vessels, he said:

"There is so much lye in the water at Santiago that the machinery and boilers of all the vessels are pitted and eaten away, and besides this, the heavy armor plate on the vessels would have to be taken off and the vessels replated at great cost. The Cristobal Colon could have been made into a good warship if she had been raised soon after she was sunk. She lies on her side on the reef where the New York turned her over trying to push her ashore, and the only method to raise her now would be to drag her into shallow water and then turn her over upon her bottom so that her decks would be out of water. We were eight days and nights towing the Reina Mercedes to Norfolk, Va., a long, dreary spell; but then it paid very well, for it was everything or nothing, as my contract with the government was, no cure, no pay. If I got her safe and sound to Norfolk, I was to get \$75,000; if not I was to get nothing, and I won."

"There was over \$300,000 represented in the tow from Santiago, and I thought the best plan would be to be on hand if another crisis appeared like that in the case of the Maria Teresa. We had a good time all the way up—it was like a picnic party. The Mercedes was badly battered by our



EVOLUTION OF THE MERCHANT SHIP.

The English marine artist, R. Quiller-Lane, in the accompanying drawing, made for the Review, illustrates at a glance the evolution of the cargo-carrying vessel. The modern type of vessel is the new steamer Salamis, just built at Aberdeen by Hall, Russel & Co. for the well known Aberdeen line. She exceeds by at least 1,000 tons the tonnage of any other vessel ever built in the granite city. The small sketch represents the old Salamis of the same line, a vessel famous in her day as one of the leading "flyers" of the China tea trade. She was also for a time engaged with the Patriarch in the Australian wool trade.

FITTING OUT THE REPAIR SHIP VULCAN.

Some very interesting problems of construction were encountered in fitting out the naval repair ship Vulcan, which was credited with effective service during the Spanish-American war. Messrs. Gardiner C. Sims and William S. Aldrich detail some of them in an article contributed to the current number of the Engineering Magazine. In part it is stated: "From the standpoint of equipment the key to the Vulcan's success as a floating repair shop is to be seen in the selection and the arrangement of the machinery on the shopdeck. A foundry at sea had not been heard of before the cruise of the Vulcan. The foundry floor was made by cutting away the 3-inch wood planks of the shop deck to the steel deck-plates below, laying down half-inch asbestos board and then filling in to the original level of the deck with concrete, mixed in the proportion of one part of Portland cement to one and a half of sand. Directly beneath the cupola a fire brick floor was laid in cement on the asbestos board, and a cast-iron foot piece placed in the center to receive the bearing bar of the cupola bottom. The intense heat from the brass furnaces and stacks, and from directly over the cupola tap hole, proved the most difficult problem with which we had to deal in this part of the Vulcan's equipment. The whole wooden deck above the brass furnaces and the foundry floor was protected by asbestos board, overlaid with tin. Sheet iron was placed between the deck beams above the tap hole, giving about 8 inches of clear space between it and the wooden deck above for the free circulation of air."

One dollar Sunday outings—Beginning Sunday, May 28, and until further advised, parties of five or more traveling together on one party ticket going and returning same day, may travel on any train of the Nickel Plate road to and from any station west of Wallace Junction, Pa., not more than one hundred miles from starting point, for \$1 for each person. Where single fare is \$1 or less, individual tickets will be sold going and returning same day at one fare for the round trip. Confer with ticket agents for further particulars. 41, June 31

ships before she was sunk by the Spaniards in their endeavor to block the channel, a proof of the wonderful skill of our gunners. Holes in her which we could not caulk with pine corks we covered up with iron plates. There were about twenty-five men aboard the cruiser on her trip up. She leaked some and the pumps were kept going. We took off a number of her guns. We left only the big ones aboard. I do not think the guns will ever be of any service to our progressive nation, as they are already behind our own. I think the Reina Mercedes can be made into a serviceable warship."

STEAM YACHT JULE.

The Fore River Engine Works, Weymouth, Mass., has successfully launched the handsome steam yacht Jule, building for Commodore B. P. Cheney of the Boston Yacht Club, and his wife, the latter known to the public as Julia Arthur, the actress. This little vessel was launched with all machinery in place and steam up, so that she was enabled to go into commission at once. Indeed the trial trip was held the same afternoon as the launching, and the yacht easily attained the stipulated speed of nine miles an hour.

The Jule was not built with the idea of attaining any exceptional speed, but is, on the other hand, designed for service in heavy weather, seaworthiness being a necessity in view of her intended service between Boston and Mr. Cheney's summer home at Great Brewster. The yacht is 56 feet 3 inches over all, 51 feet 4 inches on the water line and 12 feet 6 inches beam. She is fitted with a compound engine and water tube boiler. The arrangement of the vessel is admirable. Aft there is a roomy cockpit with accommodations for seating at least a dozen persons, together with closets, a bath room, etc. The main saloon is quite "roomy" for the size of the vessel, and is fitted with a number of berths.

Major Geo. McC. Derby, United States engineer corps, New Orleans, will open proposals June 30 for furnishing for government service a steel or iron tug boat about 90 feet long.

ROYAL YACHT MACHINERY.

PARTICULARS OF ENGINES AND BOILERS FITTED IN THE PLEASURE CRAFT VICTORIA AND ALBERT, BUILDING FOR THE BRITISH SOVEREIGN.

The machinery installation in the royal yacht Victoria and Albert, which was recently launched at Pembroke dock yard (see last week's issue of the Review for description of the vessel) is very completely described in Engineering of London. Engines and boilers are arranged in four water-tight compartments, the engines being in two, side by side, and the boilers in two, one before the other. The two sets of machinery will develop 11,000 indicated horse-power for eight hours and 7500 indicated horse-power continuously. The pressure of steam in the boilers will be 300 pounds per square inch, lowered by a reducing valve to 250 pounds at the engines. The engines are of the vertical four-cylinder triple-expansion description. The high pressure cylinder is on the forward side of the intermediate, and these two are between two low pressure cylinders. The slide valves are of the piston type for the high and intermediate cylinders, and flat valves, with relief rings on the back, are fitted to the low pressure cylinders. The valves are so set that one-third of the power may be developed in the high pressure cylinders, one-third in the intermediate, and one-third in the combined low pressure cylinders. The piston and connecting-rods, bearings, etc., are similarly proportioned. In order to make the crank shafts interchangeable the crank-pins are all the same diameter, their lengths being proportioned to give the required surfaces. The cranks are arranged at such angles as will keep the engines free from vibration.

The high pressure cylinders are 26½ inches, the intermediate 44½ inches, and the low pressure cylinders 53 inches in diameter, with a stroke of 3 feet 3 inches. The revolutions for the maximum power will be 140 per minute. The high and intermediate pressure cylinders are fitted with piston valves, and the low pressure with flat valves with large relief rings. The valves are each worked by double eccentrics and a single solid bar link. The crank shafts are in two pieces, 14½ inches external and 8¾ inches internal diameter. The crank pins are 15½ inches external and 8½ inches internal diameter, their lengths being 20 inches for the high and intermediate pressure cylinders, and 13 inches for the low pressure. The engines are reversed by steam as well as by hand. The reversing engines each have two cylinders 5½ inches in diameter and 6 inches stroke, and make about 130 revolutions in putting the link over from ahead to astern by means of a direct-acting double-threaded screw. To prevent any material amount of racing, each set of main engines is provided with an Aspinall's patent governor, which actuates a throttle valve fitted in the steam pipe close to the regulating valve. A lever is fitted to the back column of the high pressure cylinder, to which the governor is attached, and this is designed to prevent the engines exceeding their normal revolutions by more than 5 per cent. The steam pipe from the forward boiler-room is connected to the starboard engines, and that from the after boilers to the port engines, with a connection in the engine-room. Separators with automatic and hand blow-off arrangements are fitted in the after boiler-room to these pipes. There are two condensers in each engine-room with the requisite connections for working the main engine when either condenser is shut off. This provision is made so that in the event of leakage occurring, the condenser may be disconnected and the defect remedied, without stopping the engines. These condensers are placed horizontally, and the water circulates outside the tubes. The tube-cooling surface is 12,000 square feet, or a little less than 1.1 square foot per indicated horse power. The tubes are 5½ inches external diameter, secured to the plates by screwed glands and tape packing. The air pumps, 11¼ inches in diameter, are worked directly from each low pressure piston, and under normal conditions each draws from its own condenser, but means are fitted for supplying each air pump with water to prevent overheating when the corresponding condenser is not in use.

One circulating pump is provided in each engine-room and a connection is made through the middle line bulkhead to allow of either pump supplying all the condensers. The impellers are 45 inches in diameter and the sea suction and discharge pipes 16 inches. The usual provision is made for these pumps to draw from the bilge. There are four fire and bilge pumps, each capable of delivering 60 tons of water per hour. These with the two circulating engines will, if required, pump about 2300 tons of water per hour from the bilge. A patent "gravitation" feed-water heater is fitted in each engine room through which the air pumps deliver into the feed tanks. A vertical auxiliary condenser with 800 square feet of cooling surface and a combined circulating and air pump, are provided in each engine. A turning engine with two cylinders 4½ inches in diameter and 5 inches stroke is fitted in each engine room to move the main engines through one revolution in not more than eight minutes. Provision is also made for turning the engines by hand.

The screw propellers are arranged to work inwards when the vessel is steaming ahead. Each boss is fitted with three adjustable blades. The propellers are of ordinary gun-metal, the blades being secured to the boss by bolts of forged bronze. The diameter of the propellers is 13 feet 3 inches. The blades are set at a pitch of 17 feet 6 inches, and have an expanded surface of 12 square feet for each propeller. Duplicate steering engines by Messrs. Caldwell & Co., Glasgow, are arranged one in each engine room, with shafting, etc., for working them from the bridge. The worms, which are below their wheels, work in an oil bath. At the after end of each engine room, close to the cool chamber, there is a refrigerating machine. Each machine is capable of keeping a chamber of 2500 cubic feet at a temperature of 15 deg. in the tropics, and of keeping the atmosphere in the chamber dry. There are three sets of electric light engines with dynamos, each set being of 600 amperes. To assist in ventilating the engine rooms there are four blowing fans, one at each end of each engine room. The main cylinders are clothed on their sides, bottoms, and covers with mica. This is covered with polished mahogany secured by burnished brass strips. The flanges are covered with a planished steel casing fitted in portable sections, so that it may be readily removed. Asbestos cloth is fitted under the attachments of the mahogany and the steel.

The boilers are of the Belleville type, and the safety valves are loaded by springs to 300 pounds per square inch. In the forward compartment there are six boilers, each containing eight generator and seven economiser elements, and three with ten generator and eight economiser elements. In the after compartment there are nine boilers, each with ten generator and eight economiser elements. The generator and economiser tubes are 4 inches and 2¾ inches in diameter respectively. The total heating surface is 26,000 square feet, or about 2.35 feet per indicated horse power, and the grate surface is 840 square feet, which will give about 13 indicated horse power per square foot. The feed pumps, which are of the Belleville vertical direct-acting description, are in the boiler rooms, there being two main and two auxiliary, each about 11½ inches in diameter and 19¾ inches stroke. In each boiler compartment there is one double-cylinder and one single-cylinder engine for delivering jets of air above the fires and into the combustion chambers to assist in mingling the gases. The boilers are to work under natural-draft conditions, but fans are provided to insure a plentiful supply of air to the stokeholds under all conditions of wind. Four See ash ejectors, with two pumping engines, are provided for discharging the ashes through the sides of the vessel, and there are two ordinary ash tubes and engines for use in harbor.

MARINE ENGINEERING.

AN INTERESTING REVIEW OF PROGRESS OF THE YEAR WITH INSTRUCTIVE COMMENTS IN THE NEW EDITION OF BRASSEY'S NAVAL ANNUAL.

One of the most interesting features of the 1899 edition of Lord Brassey's naval annual, which is just to hand, is the resume of the progress of the year in marine engineering by G. R. Dunell. The writer, after making the introductory comment that during the past year the eyes of British naval engineers have been turned chiefly to American waters for instruction, dwells at some length on the exploit of the Oregon in making the remarkable trip around the continent, the credit for which is accorded largely to the discipline and efficiency of the engineering staff. Continuing Mr. Dunell says:

"During the past year the water tube boiler has been the most important subject engaging the attention of naval engineers, but there has been no mechanical feature like the economizer of last year introduced of sufficient importance to demand any extended notice. The most interesting point in connection with the water tube boiler is the fact that the engineer-in-chief of the United States navy has declared in its favor. The fact that the designs of American warships continue to include shell boilers was a forcible argument for some time brought forward against the water tube principle by its opponents. The engineering bureau of the United States navy never experienced the boiler difficulties that afflicted our own admiralty engineers a few years ago, when the present engineer-in-chief had to take up the burden of troubles which he inherited on assuming his position. For that reason Commodore Melville has not felt the same incentive to hurry in making the change, but he has now made up his mind to endorse Sir John Durston's policy."

The annual report of Rear Admiral Melville, or rather that portion of it which deals with the boiler problem is then taken up and comment made thereon as follows: "Commodore Melville speaks of water-tube boilers in general, not specifying any particular type, but in our navy the Belleville boiler is almost the only description now used for vessels larger than torpedo craft, the exceptions being a few water tube boilers of other designs fitted chiefly for experimental purposes. The charges brought against the Belleville boiler have during the last year almost been narrowed down to a low efficiency in fuel consumption. The careful and exhaustive trials made with our ships during the last two or three years do not bear out this indictment. The 1.71 pounds of coal burnt for each horse power exerted for an hour in the Terrible is certainly an excellent record for a naval trial, and we may safely conclude that the performance can be bettered with economizer boilers."

After discrediting the arguments of the many critics who condemn the present British navy boilers, basing their strictures upon a comparison of mercantile and war vessel fuel economies, the author says: "A war vessel is designed to fight. No consideration of the coal bill must be allowed to interfere in this respect, and as speed is one of the chief fighting elements, engines are made big and boilers small in comparison. Big engines are needed to give high power at a pinch, but big engines are wasteful of steam at low powers, chiefly from the enormous amount of condensation that takes place in the cylinders. Low powers are also wasteful on account of increased ratio of friction to useful work, but that does not appear on the indicator cards. If we follow the reasoning out we find the naval engineer who tries to make a good economy trial on the horns of this dilemma. If he burn his coal slowly so as to give plenty of time to evaporate plenty of water in the boiler before the heat gets away up the chimney, he only condenses in the engines a good part of the steam generated. That is one horn. The other is that if steam enough be generated to drive the engines economically the boilers are not working at their best fuel efficiency, for too much heat is escaping by the chimney. The judicious engineer will discover which is the best compromise. Many suggestions have been made to overcome this difficulty and reduce the size of the cylinders to a nearer approximation to what they should be for the quantity of steam passing through them. Two sets of engines have been placed in the same fore-and-aft line to drive one propeller. The arrangement has considerable disadvantages, sufficient in our navy to prevent its further adoption. One great difficulty is to keep the crank shafts in line. In order to obviate the waste of steam due to over-big engines a plan has been put in operation by which smaller or auxiliary propelling engines are brought into play for low or moderate speeds."

Another question discussed is that of auxiliaries. In summing up the situation in this regard, Mr. Dunell says: "The facts here put forward in regard to auxiliaries on war ships indicate that the time has arrived when the whole question needs, not so much consideration as revision. In the early days of steam propulsion there was little more than the main

engines and donkey pumps to which steam had to be supplied, but now with power for handling guns or revolving turrets, for hoisting, steering, air-compressing, ventilation, electric light, forced draft and the many other purposes, there are pipes and machinery all over the ship. The loss of fuel due to the use of dozens of small engine cylinders is by no means the only evil that has to be faced. The radiation from steam pipes raises the temperature to a most undesirable extent, as well as causing waste of heat. Again, bulkheads have to be pierced, and allowance made for expansion and contraction due to varying temperature in the pipes."

Discussion of the subject of engineering is concluded with comment on a couple of vessels now building in which considerable interest is felt both in this country and in England. The author says: "In the last number of this annual reference was made to C. A. Parson's wonderful little torpedo boat, the Turbinia, and it was then stated that two destroyers were about to be built which would contain machinery similar to that in the vessel referred to. These boats are still in hand, but so much interest is attached to them that the following particulars may be given in advance: The length between perpendiculars is 210 feet, the extreme breadth 21 feet and the molded depth 12 feet 9 inches. At a draught of 5 feet 4 inches the displacement would be 320 tons. The engines are similar in design to those of the Turbinia, but differ from the latter in so far as they are composed of two separate sets of engines for the port and starboard sides of the vessel. It will be remembered that in the Turbinia there were three propeller shafts, on each of which were three screws; in the new boats there will be four propeller shafts each with two screws. The engines of these new vessels are designed to develop five times the power of the Turbinia's engines. The collective horse power in each vessel will be 10,000 indicated, which is calculated to give a speed in excess of 35 knots. Mr. Parsons has not yet, so far as we are aware, prepared designs for a large cruiser, but we know that he has had drawings made for an Atlantic liner fitted with his type of marine engines."

The thirteenth edition of the Annual is one of the best yet published. An unusual amount of attention is accorded to the United States navy, and among the new features presented in the work this year is an account of the United States navy by Lieut. Commander W. H. Beehler of the naval intelligence office at Washington and a review of the Spanish-American war by Col. Sir George Clarke. The Annual is published by Griffin & Co. of Portsmouth, and is for sale in America by the D. Van Nostrand Co. of New York, at \$6 per copy.

AROUND THE GREAT LAKES.

A resolution introduced in the Canadian house of commons heartily indorses the project to improve the harbors of Port Dalhousie and Port Colborne at opposite ends of the Welland canal.

Byron Whittaker of Detroit has sold the schooner S. R. V. Watson, which was one of the fleet chartered by the Atlantic Transportation company, to New York parties for a consideration of \$4,000.

On a recent trip from the head of Lake Superior to Buffalo, the cargo of the package freighter Troy (New York Central Line) consisted of 54,000 barrels of flour, 350 tons of copper and 60 tons of shingles.

Frank D. Welcome, one of the best known masters on the great lakes, has been made general passenger and freight agent of the Buffalo & Erie Transportation Co., which operates the new steamer Pennsylvania.

Rumor has it that J. Pierpont Morgan is back of the new Boston Coal, Dock & Warehouse Co. which has purchased the docks of the Pennsylvania & Ohio Coal Co. at Ashland, Manitowac and other upper lake ports.

The Donnelly Wrecking & Salvage Co. of Kingston, Ont., in a recent effort to locate the wreck of the tug Walker near Nicolson's island, came upon the wreck of the steamer Zealand, which was lost about twenty years ago.

A Menominee firm has inaugurated a new method of carrying lumber by utilizing the railroad scow Mickado as a tow for the steamer Annie Laura. Over 600,000 feet of lumber was carried on the scow on a recent trip to Toledo.

Tonnage of the steamer Henry W. Oliver, built at Lorain for the Wilson Transit Co. is 4,909 gross and 3,617 net tons. The new passenger steamer Pennsylvania just completed by the Detroit Dry Dock Co. is of 747 gross and 420 net tons.

According to Capt. Davis of the revenue cutter Morrill, violations of speed regulations governing navigation in the "Soo" river have become frequent of late. Capt. Davis issued a warning to captains to observe greater care in the matter.

Whitney Bros. of West Superior, Wis., who have the contract for a considerable amount of pile driving, log hauling and derrick work at the head of the lakes, have just purchased two tugs that will be employed in the fulfilment of these contracts.

Supt. Kimball of the United States life saving service reports that excellent progress is being made in the preparation of plans and specifications for the new stations to be erected at Charlevoix, Grand Marais, Sleeping Bear Point and Manitou islands, Mich.

The McReynolds Elevator Co. of South Chicago has awarded to the Botsford-Jenks Co. of Port Huron the contract for the erection of a 1,500,000-bushel elevator the cost of which will be in the neighborhood of \$300,000. It is expected that the elevator will be completed in time for the fall grain trade.

Resolutions adopted by the Toronto board of trade protest against the recent action of the Montreal and Winnipeg corn exchanges in asking that American vessels be permitted to engage in the Canadian great lake coasting trade. The resolutions declare that such permission would be the confiscation of national rights and death to Canadian shipping.

Vessels included in the fleet of the Goodrich Transportation Co. of Chicago this year will have a combined passenger capacity of 12,000 persons. The nine vessels will aggregate 10,000 tons burden. The limitation rule placed by the government on each of the steamers of the line is as follows: Christopher Columbus, 4,000; Virginia, 2,000; Indiana,

1,000; Racine, 1,000; Georgia, 1,000; Chicago, 500; Sheboygan, 500; Atlanta, 1,000 and Iowa, 1,000.

Maj. T. W. Symons, United States engineer at Buffalo has recommended that as lowest bidders Hingston & Woods be awarded the contract for dredging the Niagara river from Buffalo to a point below North Tonawanda. The bid of this firm was \$80 a day for drill boats and \$76 a day for dredges. Other bidders were L. P. & J. A. Smith of Cleveland, whose figures were \$83.50 a day for drill boats and \$107.50 for dredges, and the Buffalo Dredging Co., who bid \$84 for drill boats and \$82 for dredges.

Capt. James Reid, who recently returned to Duluth from the wreck of the steamer Harlem, reports that the vessel is in pretty bad shape. In his opinion she will have to be pontooned in order to get her off. He says that her bottom will have to be renewed in case the wrecking operations are successful and quite possibly other parts of the hull will have to be strengthened, as the action of the seas has strained her severely. It is reported, nevertheless, that the underwriters have several liberal offers for the wreck.

Representatives of the underwriters engaged in hull business on the lakes are said to be negotiating for a control of Miller Bros' dry dock plant at Chicago, their belief being that some kinds of repair work can be done there cheaper than in the docks controlled by the American Ship Building Co. It is not probable however, that the management of the consolidated ship yards expect competition from the insurance companies going into ship building or repairing operations, and anyhow the Miller plant is of an inferior kind.

Much interest has been manifested in the new steel shaft at the Aurora mine at Ironwood, Mich. The head-frame, which, by the way, is the first steel head-frame installed in the Lake Superior district, was furnished by the Wellman-Seaver Engineering Co. of Cleveland. The hoisting plant, furnished by the Webster, Camp & Lane Machine Co. of Akron, is one of the largest of the first motion type, having heavy-duty engines of 20-inch bore by 42-inch stroke, and with hoisting drums 6 feet in diameter with a total face of 9 feet, having capacity for 1,200 feet maximum depth.

A novel method was employed for the removal of the old drawbridge over the Chicago river at Taylor street. Two scows were floated under the span, and cribbing was built up to the necessary height. The bridge was then jacked up to allow of additional blocking being added to carry it clear of the center pier, and the scows were then towed down the river. A Scherzer rolling-lift, bascule bridge is to be built at this point, in order to give the necessary waterway for the drainage canal, and this bridge will be built by the trustees of the drainage board. They will also build a similar bridge to replace the railway drawbridge just below Taylor street.

ITEMS OF INTEREST.

The Bath, Me., correspondent of the Review writes that during the four summer months, May to September, the Bath Iron Works, Hyde Windlass Co. and Arthur Sewall & Co. stop work at 11:30 a. m. Saturdays, making the hours of labor each week fifty-five instead of the usual sixty. The rate of pay remains the same per hour. The Bath Iron Works employs at present 600 men, but this number has varied from 450 to 1,000 during the past two years. The Hyde Windlass Co. employs 150 to 200 men, and Arthur Sewall & Co. have on their pay roll about 150 men, which number will be increased during the summer.

The navy department has made an allotment of the appropriation of the fund of \$60,000 for the assistance of the naval militia of the states supporting such organizations. The money will be distributed in the following manner: California, \$4,336.40; Connecticut, \$1,661.70; District of Columbia, \$1,715.01; Florida, \$2,354.81; Georgia, \$1,563.95; Illinois, \$6,886.70; Louisiana, \$3,003.49; Maryland, \$1,177.22; Massachusetts, \$5,456.04; Michigan, \$1,715.01; New Jersey, \$3,119.01; New York, \$8,281.81; North Carolina, \$2,328.15; Ohio, \$2,786.10; Rhode Island, \$1,741.67; South Carolina, \$2,310.38, and Virginia, \$1,848.30.

Seldom has a vessel had a more interesting series of adventures than that in which the North German Lloyer steamer Barbarossa recently figured in New York harbor. The discovery was made soon after the vessel had set sail for Southampton that her cargo was afire, and she put back with all haste. As she came up the river at full speed, difficulties were encountered in managing her and she in rapid succession narrowly escaped running down a Pennsylvania ferryboat, struck a pier, and finally crashed into the French liner La Bretagne, making a great rent in her starboard quarter, and by the force of the impact sinking two ice barges stationed near the French vessel. The Barbarossa was enabled to leave port the same evening, but some time was required for the repairs on the French liner.

Capt. Chittenden who was in charge of the Merritt-Chapman wrecking Co.'s operations on the sunken Spanish cruiser Reina Mercedes says that the work of raising the Mercedes was begun Jan. 2, 1898, and on March 1 she was towed into Santiago harbor. She lay on the brink of a ledge with 26 feet of water inshore and 42 outshore, with a list of 28 degrees. All the joiner work, including the officers' quarters, was torn out and the wreckers built a coffer dam on the main deck just forward of the bridge. In this dam 30,000 feet of lumber, six tons of bolts, and 800 yards of canvas were used. The water-tight dam was pumped out, the vessel rose and was towed to Santiago, with 12 feet of water in her hold. She drew on delivery in this country only 22 feet of water. All her guns except two 16-centimeter rifles have been taken off. These were made in Havre in 1886. They are badly rusted and in one a shell is jammed.

Nickel Plate road excursion to California account of National Educational Association convention at San Francisco, Cal.—Tickets on sale June 24 to July 7. One fare, plus two dollars, for the round trip. Ask agents of the Nickel Plate road for particulars. 44, July 6.

NIXON'S STEAM YACHTS.

TWO PLEASURE CRAFT OF APPROVED DESIGN NOW UNDER CONSTRUCTION AT THE CRESCENT SHIP YARD, ELIZABETHPORT, N. J.

There is now under construction at Lewis Nixon's Crescent Ship Yard, Elizabethport, N. J., a most interesting craft; a steam yacht designed in accordance with the general model of gunboats of the Annapolis class and which is an almost exact duplicate of the handsome steamer Pathfinder, recently completed by Mr. Nixon and illustrated and described elsewhere in this issue. The Pathfinder, by the way, was designed for the coast and geodetic survey by Rear Admiral Hichborn, chief of the bureau of construction and repair, navy department. The steam yacht now on the stocks at the Nixon yard is building on a commission from J. Harvey Ladew, and is designed to replace the yacht Columbia, which he sold to the United States government during the Spanish-American war. This new yacht is, so far as known, the only one in which any regard has been given to the suggestion made since the close of the war that hereafter steam yachts be built with some reference to the possibility of their conversion into auxiliary gunboats. Plans of the Ladew yacht were submitted to the navy department in order that any suggestions relative to the necessity for stability of construction were armament to be placed aboard might be carried out. The same plan was followed as regards interior arrangements, even in the matter of engines.

The Ladew yacht is 200 feet over all, 165 feet on the water line, 33 feet 6 inches beam and 11 feet draught. She will be fitted with triple expansion engines with cylinders of 18, 27 and 45 inches diameter and 28 inches stroke. Steam will be supplied from two Scotch boilers. It is estimated that her speed will be 14½ knots, and with coal bunker capacity of 250 tons she will be enabled to steam fully 7,000 miles. The yacht, which will be brigantine rigged and have a large sail spread, will have double decks, the living quarters being located on the main and berth decks. On the main deck will be a house for the pilot with a bridge on top. The arrangement of the various apartments is in many respects admirable. Each of the five suits will consist of a bed room, sitting room and bath. The main saloon will be 16 by 32 feet; the dining saloon 18 by 30 feet; a large stateroom 14 by 24 feet extending the full width of the ship, together with pantries, galley and officers' rooms. A handsome library will be a feature of the vessel. Aft there will be eight guests' rooms on the berth deck, two bath rooms and a room with accommodations for four maids. A party of twenty-five can be carried on the yacht with entire comfort. The vessel has an elaborate system of watertight compartments together with plated decks and watertight hatches. According to present indications this yacht will be finished in August, and it is the owner's intention, after witnessing the international yacht races, to at once start on a cruise around the world.

Mr. Nixon is also building a very handsome steam yacht for Thomas W. Lawson. This vessel, for which plans were prepared by Tams & Lemoine, is 166 feet over all, 148 feet on the water line, 23 feet beam and 10 feet 6 inches draught.

PNEUMATIC TOOLS IN SHIP YARDS.

A few photographs showing different methods of applying pneumatic riveting machines to the construction of steel vessels are reproduced on the opposite page. The machines are those used at the works of the Chicago Ship Building Co., where very little hand riveting is done and where all parts of steel hulls have been put together by machinery. Other views showing appliances for interior work will probably be presented in a future issue. The Chicago Pneumatic Tool Co., manufacturing these machines, is making arrangements to urge further sales of them in Europe. With this end in view, J. I. Copeland and H. S. Mosher, representing the Chicago company, sailed from New York on the Umbria Saturday and will be gone three or four months. These gentlemen have for some time past been operating pneumatic riveters at the works of the Chicago Ship Building Co., and their mission to Europe is for the purpose of conducting some practical exhibitions of pneumatic riveting at several of the large ship building yards in England and Scotland. So successful has been the adaptation of pneumatic hammers in the ship building works of this country that the results which these gentlemen will show, will no doubt astonish our neighbors across the water and greatly increase the export business, which has already grown to be quite extensive.

By an arrangement recently made, the Chicago Pneumatic Tool Co. is to sell the entire output of the factory of the National Pneumatic Tool Co. This gives the Chicago company control of the sales of the Phoenix rotary drills, the new Haeseler piston drills and other appliances manufactured by the National Pneumatic Tool Co., as well as the Boyer riveters, hammers and piston air drills. The arrangement is amicable on both sides, and is for the purpose of reducing selling expenses on both lines of tools.

A most unique specimen in the catalogue line lately received at this office is the "Test of Time," from Ostermoor & Co. of 116 Elizabeth street, New York, manufacturers of patent elastic felt mattresses. The printing is in colors and the book is very well illustrated, many very attractive designs being used. A very complete description of the process of manufacturing felt mattress is given, and hundreds of testimonials from users of the Ostermoor mattress go a long way towards substantiating the firm's claim that it is the best. Considerable space is given to testimonials from officers of the United States navy, in the different branches of which are used over 40,000 Ostermoor mattresses.

Hiram Percy Maxim of the Columbia Automobile Co. has invented a gas engine which he claims will prove highly advantageous for use in launches. A feature of Mr. Maxim's engine is the exhaust, which is under water, a muffler being used so as to effectually deaden all sound.

Complaint is made that the old whaling vessel Progress, which was on exhibition at the world's fair, has become a total wreck and is a great nuisance at the slip of the Chicago & Calumet Dock Co. at Chicago.

REFRIGERATING MACHINES FOR FREIGHT VESSELS.

A refrigerating plant for a freight-carrying vessel on the great lakes is something new. Up to a short time ago all refrigerating machines on the market were either too expensive or the cost of operating them too much to warrant their installation on vessels of this class. Last week there was tested at the works of the Automatic Refrigerating Co., 972 Hamilton street, Cleveland, a refrigerating plant of the A. T. Ballantine patent, which was built especially for the steamer Presque Isle and on which it will be installed in a very few days.

The machine, which is illustrated herewith, is operated by steam from the regular boiler supply of the vessel, through a one-inch pipe. It is very simple in construction, consisting merely of a small steam pump and a condenser—requiring 1½ horse power to run it—and an automatic governor for regulating the expansion of the ammonia, permitting the expansion just at the time and to just the extent that is required in the work the machine is called upon to do. This governor is the paramount feature of the machine, for with its weight properly set and the power turned on, no further attention is required to any part of the machine, except to see that the bearings are kept properly oiled. In the case of the Presque Isle, where the amount of steam necessary to furnish 1½ horse power will hardly be missed, the cost of operating the refrigerating plant will be almost nothing. The Ballantine machines are made for either steam, electric or water-motor power.

About ten pounds of ammonia is necessary to charge the Presque Isle's machine. The ammonia is condensed to about 125 pounds pressure and enters the storage box with a pressure of about 15 pounds. It is this expansion which takes the heat from the box. The pump and condenser occupy a floor space of about 27 by 36 inches, and are about 36 inches in height. Almost any size of a storage box can be used. At the test made last week a storage box 8 by 2½ by 7 feet was used, and although the box was in very poor condition a temperature of 34 degrees was reached in two hours. In order to test the extreme freezing capacity of the machine, it was allowed to run, wide open, for seven hours, when the thermometer in the storage box registered seven degrees below zero. By adjusting the regulator the temperature of the box can be held at any point for an indefinite period. The Presque Isle machine has a refrigerating capacity equal to that of 1000 pounds of ice per day. If used as an ice machine it will make 500 pounds in twenty-four hours.

IMPORTANT NAVAL CHANGE CONTEMPLATED.

A letter recently addressed by Secretary of the Navy Long to Rear Admirals Hichborn, Melville and Bradford, chiefs of the bureaus of construction and repair, steam engineering and equipment of the navy department, indicates that there is now in contemplation the most radical changes in navy department organization which have been made in years. The letter asks the opinion of the officials in question as to the advisability of consolidating the three bureaus. The object, and it is a good one, is to relieve the department of contentions between the respective bureaus which have frequently been carried to the point of arousing personal animosity between officers.

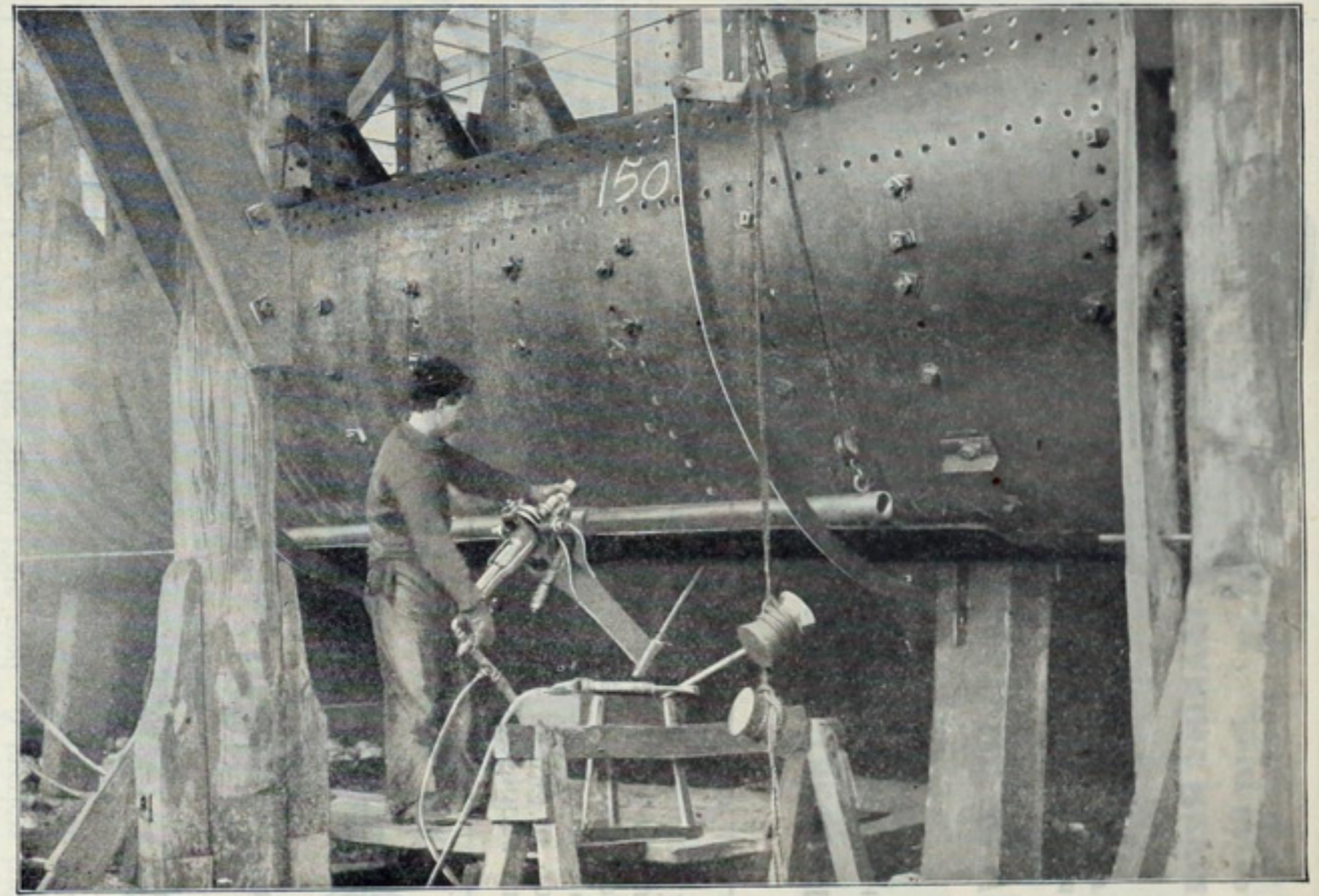
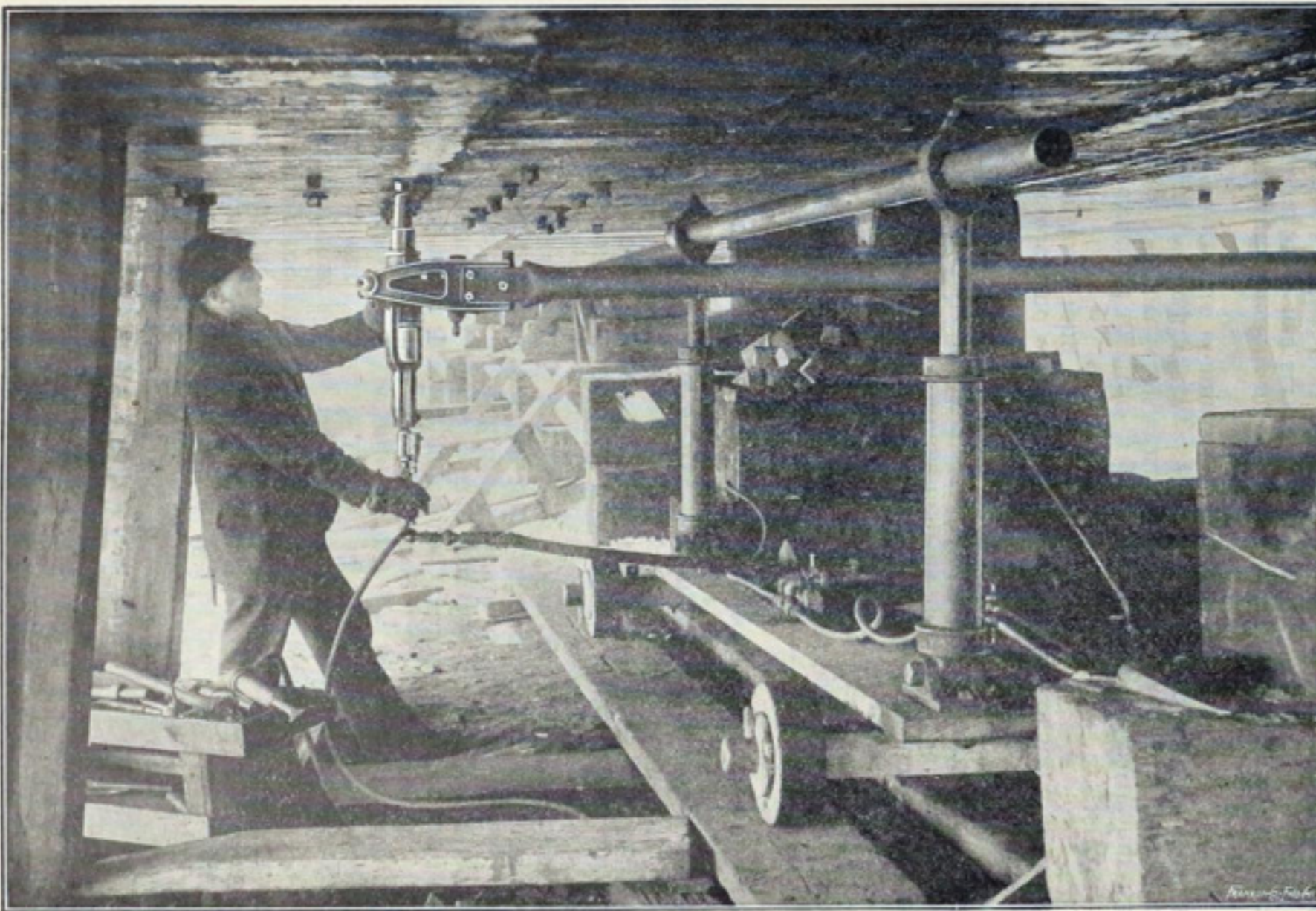
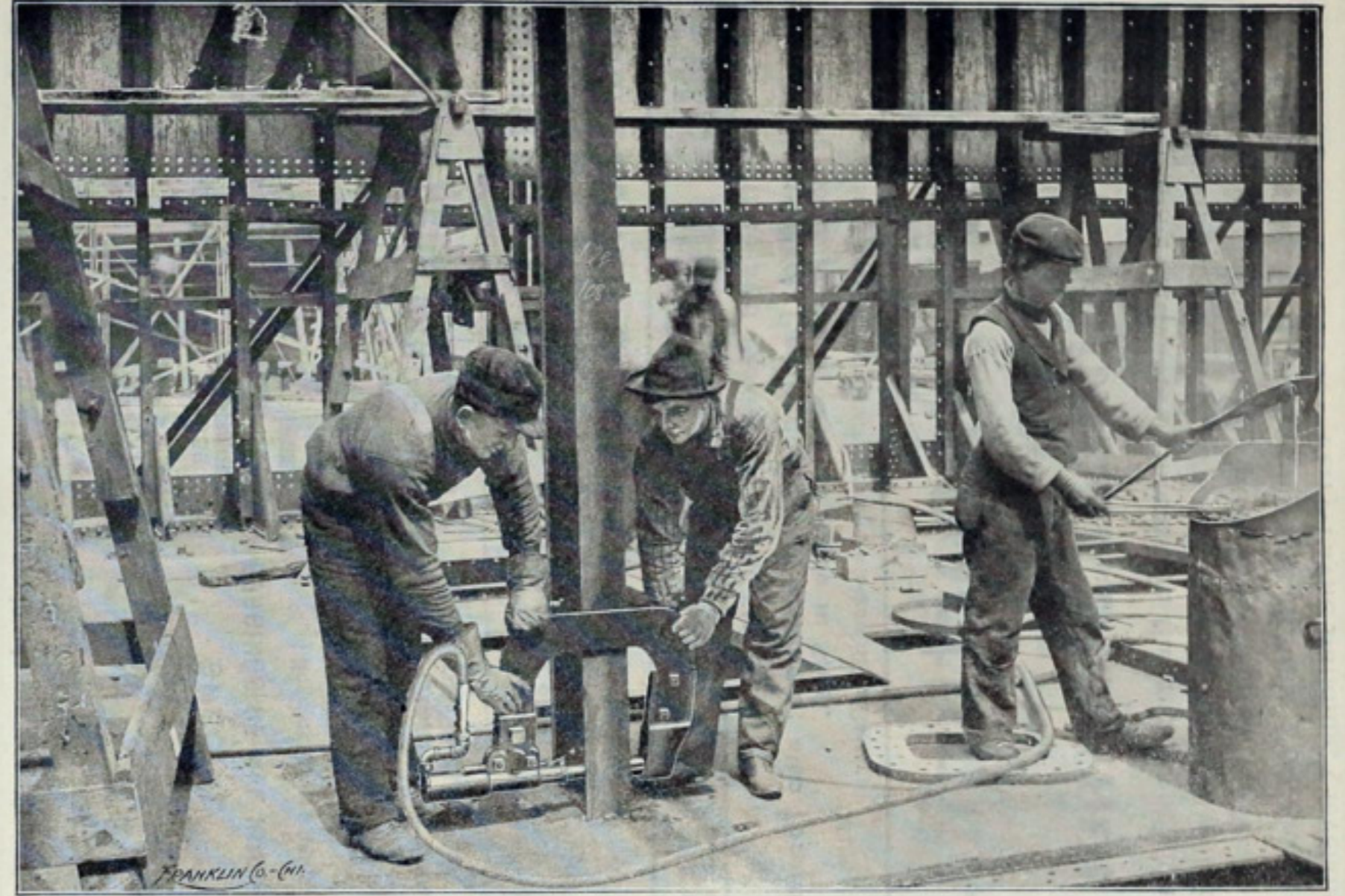
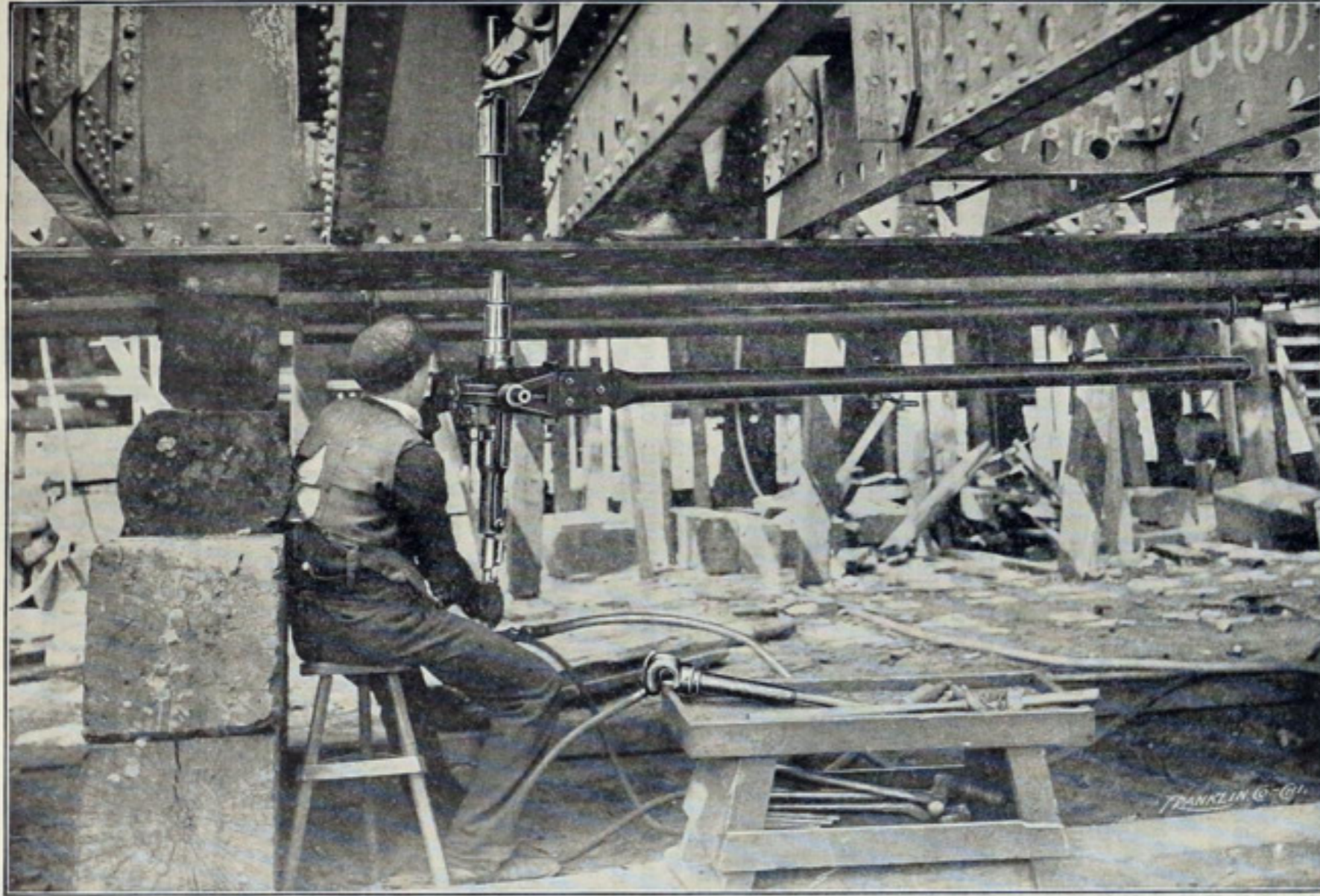
There is little doubt that Secretary Long will submit the subject of the consolidation of these bureaus to congress at its next session, and in all probability he will endorse the proposition. He contends, for one thing, that there is not a private ship yard in the country which divides up the conduct of ship building by allowing different official heads to map out the policies involved in construction and equipment work. Not only does the plan at present followed in the navy department multiply details, create delays and increase expense, but a consolidation would enable a very material reduction of the clerical forces both at Washington and at the various navy yards. Another argument advanced by Secretary Long is that the merging of the line and engineer corps in accordance with the provisions of the personnel bill makes it possible to do away with the bureau of steam engineering without the slightest danger of impairment to the service.

MOST POWERFUL TUG IN THE COUNTRY.

In an article published in various eastern papers the statement was made that the wrecking tug Rescue, recently built for a New York firm, is "the most powerful tug in the world." W. G. Wilmot & Co. of New Orleans, La., owners of the tug R. W. Wilmot, which enjoys the distinction of possessing greater power than any other tug in America, if not indeed in the world, have not allowed this statement to go unchallenged. They say in a communication on the subject: "The article headed 'The Most Powerful Tug in the World,' does the New Orleans tug R. W. Wilmot a great injustice. It is stated that the tug Rescue has triple expansion engines of 18 inches, 28 inches and 48 inches diameter, with 30-inch stroke and steam pressure of 180 pounds. As the R. W. Wilmot has triple expansion engines of 21½ inches, 33½ inches and 55½ inches, with 42-inch stroke and steam pressure of 185 pounds, it can be seen at a glance that her power is far greater than that of the Rescue. In fact, all the engine cylinders of the Wilmot could be shortened 12 inches, and still she would be much more powerful than the Rescue. The Wilmot is also provided with electric search and side lights, also a complete water distilling plant, all of which apparatus, one would suppose, after reading your article, is peculiar to the Rescue. We claim that the R. W. Wilmot is the most powerful and best equipped tugboat in America, if not in the world, and are quite willing that she shall be compared with any of the eastern tugs."

A duplex plate planing machine of unusually large size, 32 by 8 feet, has just been shipped to the navy yard at Port Royal, S. C., by the Hilles & Jones Co. of Wilmington, Del. The same company is building for Moran Bros., ship builders of Seattle, Wash., a 24-foot planer and three other planing machines.

The two "tramp" steamers building for the Boston Towboat Co. at the Sparrow's Point yard of the Maryland Steel Co. are being constructed under the rules and inspection of the United States Standard Register of Shipping, 16 and 18 Exchange Place, New York.



APPLICATION OF PNEUMATIC TOOLS TO THE CONSTRUCTION OF STEEL SHIPS AT CHICAGO.
(TOOLS MADE BY CHICAGO PNEUMATIC TOOL CO.)

TRADE NOTES.

A large contract for tools for the League Island navy yard has been awarded to the Chicago Pneumatic Tool Co.

Thos. Drein & Son, boat builders of Wilmington, Del., have just completed arrangements with the Newport News Ship Building & Dry Dock Co. for furnishing thirty-two galvanized steel life boats of the patent beaded type and six ocean life rafts to go onto the four ships for the Morgan line and two for the Cromwell line building at Newport News.

It is reported that the Waterbury Rope Co. of New York, will soon begin the manufacture of wire rope at the Tucker & Carter mills in Brooklyn. The necessary machinery has been ordered and is expected to arrive in a few days. Members of the Waterbury company are interested in a new steel plant, consequently the rope firm will be able to procure its raw material advantageously.

Miller F. Moore of Roselle, N. J., writes the Review that he is going forward with the equipment of his plant for the construction of launches on the Passaic river at Harrison, N. J. The Berlin Iron Bridge Co., East Berlin, Conn., has the contract for the erection of a two-story building 100 by 200 feet in size. An alco-vapor engine that has been in the market for several years past will also be built at the new works.

The John A. Roebling's Sons Co. of New York has been incorporated with a capital of \$100,000, to manufacture and deal in wire, rope, iron, steel, copper, and all other metals and materials used in connection with them, and to contract for building structures of such material and metals. The directors are Washington A. Roebling, Charles G. Roebling, Jr., Frank O. Briggs, Charles G. Roebling, and Ferdinand W. Roebling of Trenton, N. J., and Henry B. Shippy and Edmund Roebling of New York city.

The Standard Automatic Releasing Hook Co. of 22-24 State street, New York, recently received orders from the Chicago Ship Building Co. for a full equipment of Standard automatic releasing hooks for life boats to be furnished to the passenger steamer Illinois and the freight steamer Maunaloa. The tow barge Manila will also be provided with these hooks. Officials of the United States transport service, after a thorough investigation, have selected these hooks, and all the vessels now being refitted as transports will be equipped with them.

A most remarkable form of guarantee is now used by the Shearer-Peters Paint Co. of Cincinnati, O. The company has all along claimed the superiority of its patent Pyro paint for railroad, steamboat and bridge work, or indeed any use involving exposure. In the new guarantee, just introduced, is the clause: "On the smokestacks, furnace fronts, steam pipes, condensing pipes or any other exposure that may be shown to have been covered by our Pyro paints, we guarantee five times the durability of any other paint, and will renew the same without cost to the party against whom the account is drawn if such result is not obtained." The Shearer-Peters Co. now operate branches at Atlanta, Charlotte, N. C., Norfolk, Va., Pittsburg, New York, St. Louis, San Francisco, Minneapolis and Boston.

A Berlin, Connecticut, firm has just completed an extensive piece of structural work at Berlin, Germany, and it all came about through

rather peculiar circumstances. Six years ago representatives of a large German manufacturing concern, while traveling through the United States, were so pleased with work done by the Berlin Iron Bridge Co. of East Berlin, Conn. that they employed them to design a new shop. The American firm could not compete with the Germans in the work of erection and the structure was therefore built abroad. Some months ago the German firm decided to put up a larger building, to be used as a foundry, and again sought the services of the American company. This time the East Berlin concern was enabled to make a price so low that they received the contract and their men have been abroad for some time past erecting the steel framework of the building.

A testimonial that is rightfully very highly prized was recently received by Edward Smith & Co. of 45 Broadway, New York, manufacturers of preservative coatings for use on the interior and exterior of vessels. The Herreshoff Manufacturing Co. of Bristol, R. I., builders of the yachts which have defended the America's cup in the most recent races, are famous for the care they exercise in the selection of material, hence the gratification of Edward Smith & Co. when they some time ago received a letter from the Herreshoff company which said in part; "We are always looking for the very best material in all lines that enter into our work, and our continued use of your varnishes is, we think, sufficient endorsement of their excellence." One of the specialties for marine use which Edward Smith & Co. underline is spar coating, a perfect finish for all exterior wood and iron work, spars and the like. It has good body, is light in color, free working, elastic, durable, and dries out of the way of injury from dust in about eight hours. It has been tested by many practical ship masters, yacht and boat owners as well as by builders of these various types of craft.

Naval Constructor F. T. Bowles is quoted as saying that he will be glad to have the government build at the New York navy yard three of the 2,500-ton cruisers authorized by the last naval appropriation act. He is of the opinion that the ships can be constructed as economically and as speedily at that establishment as at any of the private ship yards. His view is not shared by some of the naval authorities in Washington who oppose the idea of having such work done at the navy yards, the facilities of which are likely to be taxed during the next three or four years by repairs and changes necessary on ships of war that have been in commission for a long time.

It is expected that the preliminary trial of the battleship Kearsarge, building at Newport News, Va., will take place early in June, and will be followed in two or three weeks by the official trial. The Kearsarge will be ready to go into commission by Sep. 1.

Complaint comes from Bath, Me., that the skyward tendency of the prices of material has served to greatly discourage the building of steel sailing vessels at that port, as well as in other parts of the country.

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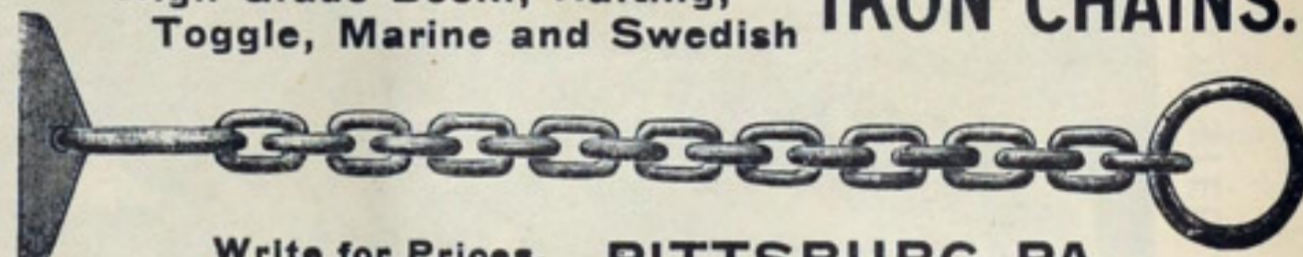
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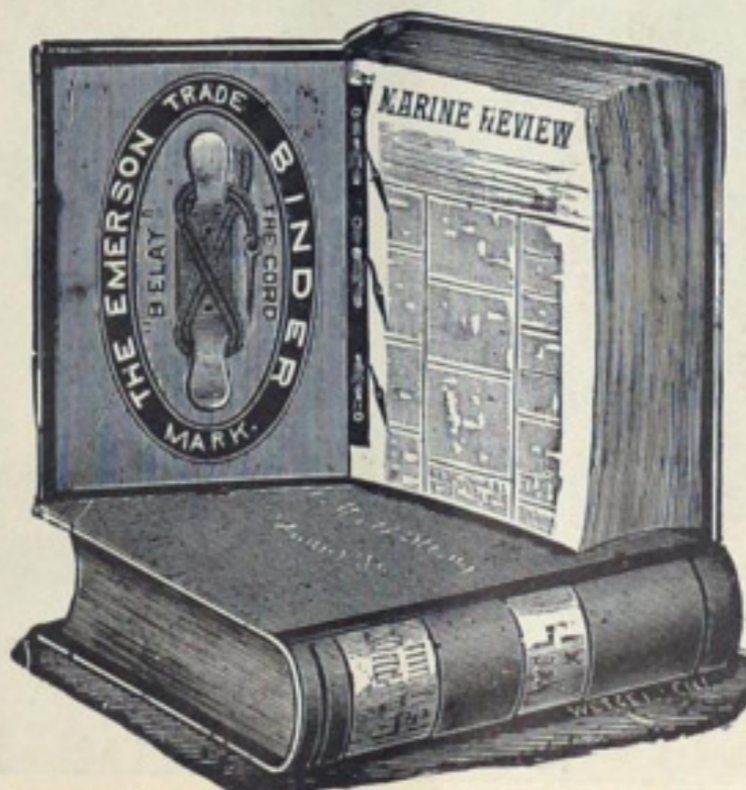
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Dimensions of the dry dock of the Superior Shipbuilding Co. at West Superior, Wis., which is now well under way and which is to be completed during the summer are: Length from head of dock to gate, 606 feet; length over all, 620 feet; width of dock at top, 106 feet; width of dock at bottom, 65 feet; width of gate, 66 feet 5 inches; width of gate at bottom, 59 feet 10 inches; depth of water over sill, 19 feet, 6 inches; depth of water on blocks, 18 feet.

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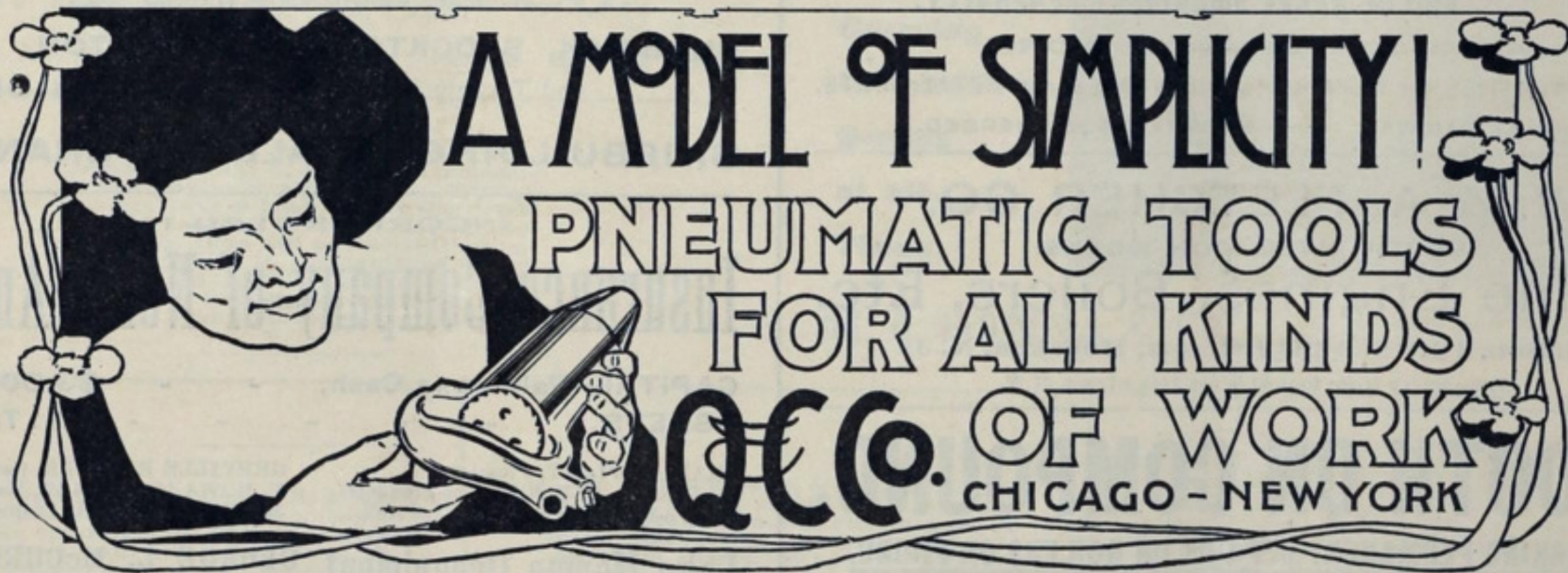
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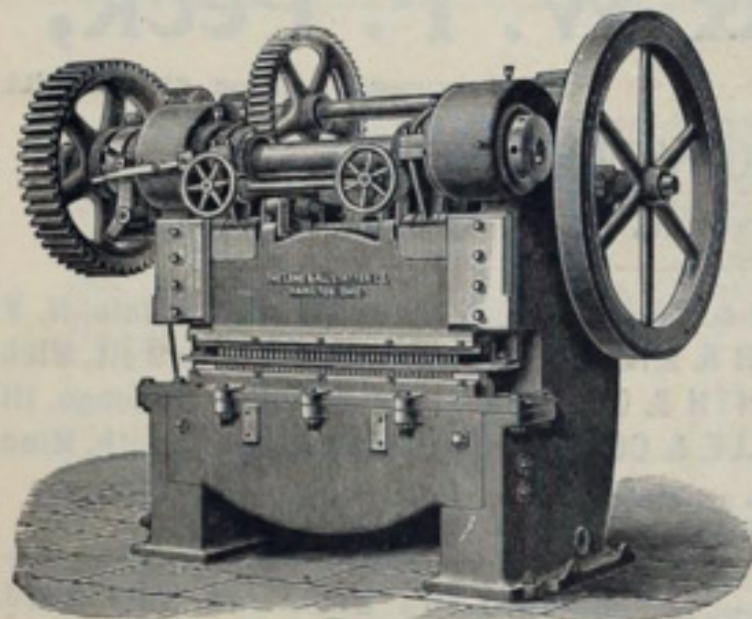
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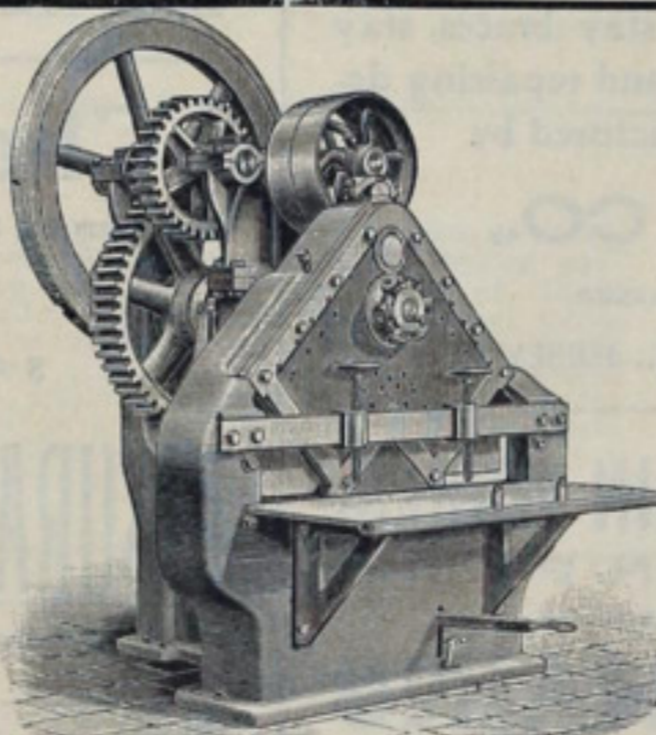
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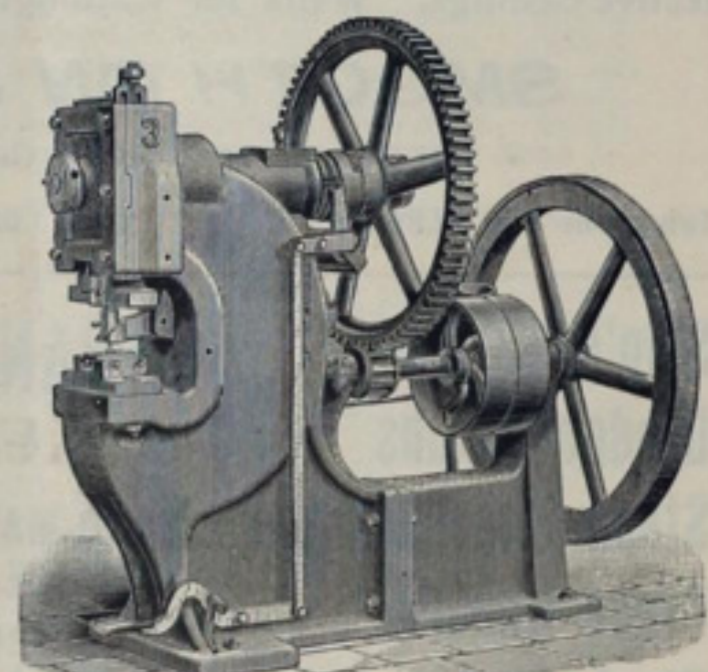
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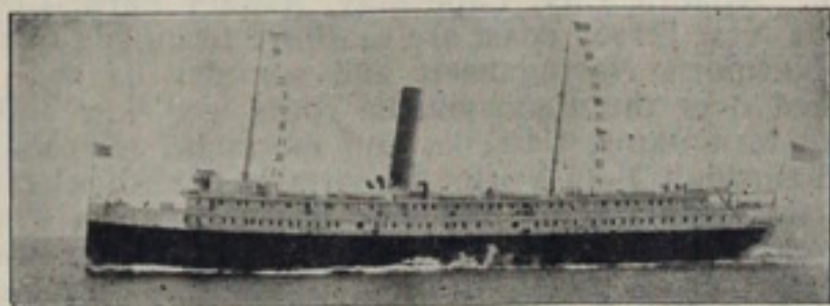


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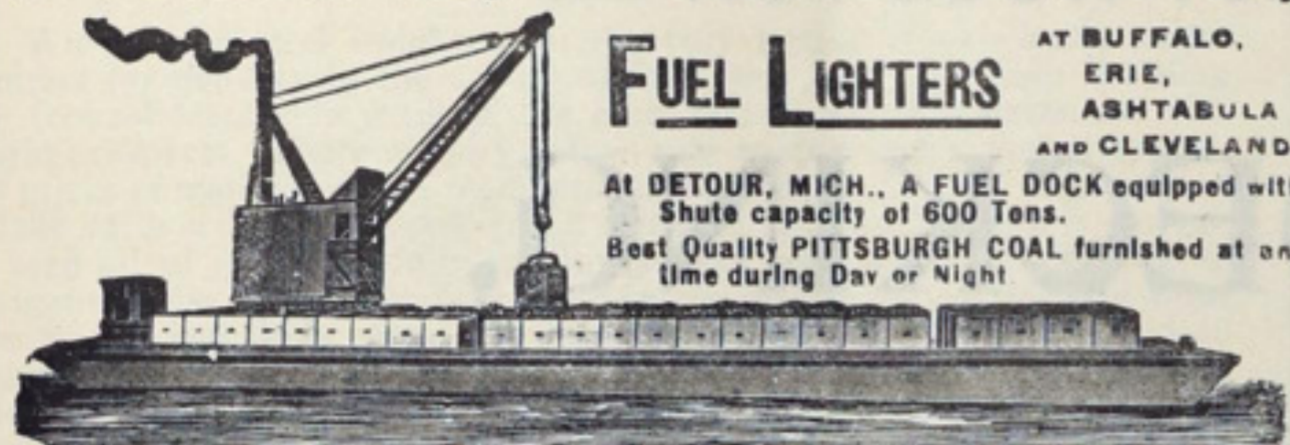
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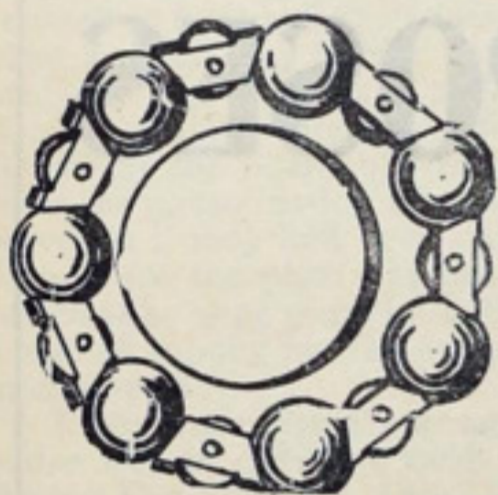
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U. S. Engineer Office, 185 Euclid Ave., Cleveland, O., May 31, 1899. Sealed proposals for dredging in Straight Channel through Maumee River and Bay, and for Constructing Dike between Turn-out Channels, Toledo harbor, Ohio, will be received here until two o'clock, P. M., standard time, Friday, June 30, 1899, and then publicly opened. Information furnished on application. Jared A. Smith, Col., Engr's. June 29.

U. S. Engineer Office, Morgan Building, Buffalo, N. Y., May 25, 1899. Sealed proposals for harbor excavation at Erie, Pa., will be received here until eleven o'clock A. M. June 26, 1899, and then opened. Information furnished on application. T. W. Symons, Major, Engr's. June 22.

PROPOSALS FOR CONSTRUCTION OF FLAT BOATS.—U. S. ENGINEER OFFICE, Custom House, St. Louis, Mo., May 23, 1899. Sealed proposals for construction and delivery of sixty flat boats will be received here until 12 o'clock, noon, June 22, 1899, and then publicly opened. Information furnished on application. Edw. Burr, Captain, Engrs. June 15.

U. S. Engineer Office, Duluth, Minn., June 1, 1899. Sealed proposals for building pile and timber revetments for Ship Canals across Keweenaw Point, Mich., will be received here until noon, July 1, 1899, and then publicly opened. Information furnished on application here, or, at branch office Houghton, Mich. Clinton B. Sears, Major, Engrs. June 22.

U. S. Engineer Office, 57 Park St., Grand Rapids, Mich., May 10, 1899. Sealed proposals for repairing Government Piers at Holland (Black Lake), Mich., will be received here until 3 p. m., June 9, 1899, and then publicly opened. Information furnished on application. Chester Harding, Capt., Engrs. June 1.

U. S. Engineer Office, 185 Euclid Ave., Cleveland, O., May 12, 1899. Sealed proposals for constructing part of West Breakwater at Conneaut Harbor, Ohio, will be received here until 2 o'clock, p. m., central standard time, June 12, 1899, and then publicly opened. Information furnished on application. Jared A. Smith, Col., Engineers. June 8.

U. S. Engineer Office, 185 Euclid Ave., Cleveland, O., May 12, 1899. Sealed proposals for constructing part of West Breakwater at Fairport Harbor, Ohio, will be received here until 2 o'clock p. m., central standard time, June 12, 1899, and then publicly opened. Information furnished on application. Jared A. Smith, Col., Engrs. June 8.

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U. S. Engineer Office, Galveston, Tex., May 15, 1899. Sealed bids, in triplicate, for deepening channel from Galveston Harbor to Texas City, Tex., will be received until 2 p. m., June 15, 1899, and then publicly opened. For information apply to C. S. Riche, Capt., Engrs. June 8.

U. S. Engineer Office, 185 Euclid Ave., Cleveland, O., May 9, 1899. Sealed proposals for dredging in Cleveland Harbor, Ohio, will be received here until 2 o'clock, p. m., standard time, June 9, 1899, and then publicly opened. Information furnished on application. Jared A. Smith, Col., Engrs. June 1.

U. S. Engineer Office, 57 Park St., Grand Rapids, Mich., May 11, 1899. Sealed proposals for repairing government piers at Grand Haven, Mich., will be received here until 3 p. m., June 10, 1899, and then publicly opened. Information furnished on application. Chester Harding, Capt., Engrs. June 8.

U. S. Engineer Office, 57 Park St., Grand Rapids, Mich., May 15, 1899. Sealed proposals for repairing government piers at Muskegon, Mich., will be received here until 3 p. m., June 14, 1899, and then publicly opened. Information furnished on application. Chester Harding, Capt., Engrs. June 8.

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